JC03 Rec'd PCT/PTC 24 JUL 2001
09/889966

Practitioner's Docket No. U013563-5

Optional Customer No. Bar Code

00140
PATENT TRADEMARK OFFICE

CHAPTER II

TRANSMITTAL LETTER TO THE UNITED STATES ELECTED OFFICE (EO/US)

(ENTRY INTO U.S. NATIONAL PHASE UNDER CHAPTER II)

PCT/IB00/00135	28 JANUARY 2000	1 FEBRUARY 1999
INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED

INTERACTIVE SYSTEM
TITLE OF INVENTION

PATRICK J. **RAINSFORD**
APPLICANT(S)

Box PCT
Assistant Commissioner for Patents
Washington D.C. 20231
ATTENTION: EO/US

NOTE. The completion of those filing requirements that can be made at a time later than 30 months from the priority date results from the Commissioner exercising his judgment under the authority granted under 35 USC 371(d). The filing receipt will show the actual date of receipt of the last item completing the entry into the national phase. See 37 C.F.R. §1.491 which states: "An international application enters the national state when the applicant has filed the documents and fees required by 35 USC 371(c) within the periods set forth in § 1.494 and § 1.495."

CERTIFICATION UNDER 37 C.F.R. 1.10*
*(Express Mail label number is **mandatory**.)*
(Express Mail certification is optional.)

I hereby certify that this correspondence and the documents referred to as attached therein are being deposited with the United States Postal Service on this date July 24, 2001, in an envelope as "Express Mail Post Office to Addressee," Mailing Label Number EL728214115US, addressed to the: Assistant Commissioner for Patents, Washington, D.C. 20231.

JENNIFER RASHKIN
(type or print name of person mailing paper)

Signature of person mailing paper

WARNING: *Certificate of mailing (first class) or facsimile transmission procedures of 37 C.F.R. 1.8 cannot be used to obtain a date of mailing or transmission for this correspondence.*

***WARNING:** *Each paper or fee filed by "Express Mail" **must** have the number of the "Express Mail" mailing label placed thereon prior to mailing. 37 C.F.R. 1.10(b).*
*"Since the filing of correspondence under § 1.10 without the Express Mail mailing label thereon is an oversight that can be avoided by the exercise of reasonable care, requests for waiver of this requirement will **not** be granted on petition." Notice of Oct. 24, 1996, 60 Fed. Reg. 56,439, at 56,442.*

PCT/IB00/00135

WARNING: *Where the items are those which can be submitted to complete the entry of the international application into the national phase are subsequent to 30 months from the priority date the application is still considered to be in the international state and if mailing procedures are utilized to obtain a date the express mail procedure of 37 C.F.R. §1.10 must be used (since international application papers are not covered by an ordinary certificate of mailing - See 37 C.F.R. §1.8.*

NOTE: Documents and fees must be clearly identified as a submission to enter the national state under 35 USC 371 otherwise the submission will be considered as being made under 35 USC 111. 37 C.F.R. § 1 494(f).

1. Applicant herewith submits to the United States Elected Office (EO/US) the following items under 35 U.S.C. 371:

   a. [X] This express request to immediately begin national examination procedures (35 U.S.C. 371(f)).

   b. [X] The U.S. National Fee (35 U.S.C. 371(c)(1)) and other fees (37 C.F.R. § 1.492) as indicated below:

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2.Fees

CLAIMS FEE	(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) CALCULATIONS
[ ]*	TOTAL CLAIMS	28 - 20 =		x $ 18.00 =	$ 144.00
	INDEPENDENT CLAIMS	2 - 3 =		x $ 80.00 =	
	MULTIPLE DEPENDENT CLAIM(S) (if applicable) + $270.00				
BASIC FEE**	[ ] U.S. PTO WAS INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where an International preliminary examination fee as set forth in § 1.482 has been paid on the international application to the U.S. PTO: [ ] and the international preliminary examination report states that the criteria of novelty, inventive step (non-obviousness) and industrial activity, as defined in PCT Article 33(2) to (4) have been satisfied for all the claims presented in the application entering the national stage (37 CFR 1.492(a)(4)) ..... $100.00 [ ] and the above requirements are not met (37 CFR 1.492(a)(1)) ..... $690.00 [x] U.S. PTO WAS NOT INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where no international preliminary examination fee as set forth in § 1.482 has been paid to the U.S. PTO, and payment of an international search fee as set forth in § 1.445(a)(2) to the U.S. PTO: [ ] has been paid (37 CFR 1.492(a)(2)) ..... $710.00 [ ] has not been paid (37 CFR 1.492(a)(3)) ..... $1,000.00 [x] where a search report on the international application has been prepared by the European Patent Office or the Japanese Patent Office (37 CFR 1.492(a)(5)) $860.00				
	Total of above Calculations				=1004.00
SMALL ENTITY	Reduction by ½ for filing by small entity, if applicable. Statement may also be filed. (note 37 CFR 1.9, 1.27, 1.28)				-
	Subtotal				1004.00
	Total National Fee				$1004.00
	Fee for recording the enclosed assignment document $40.00 (37 CFR 1.21(h)). (See Item 13 below). See attached "ASSIGNMENT COVER SHEET".				
TOTAL	Total Fees enclosed				$1004.00

*See attached Preliminary Amendment Reducing the Number of Claims.

i. [x] A check in the amount of 1004.00 to cover the above fees is enclosed.
ii. [ ] Please charge Account No. _____ in the amount of $ _____.
A duplicate copy of this sheet is enclosed.

**WARNING: *"To avoid abandonment of the application the applicant shall furnish to the United States Patent and Trademark Office not later than the expiration of 30 months from the priority date: * * * (2) the basic national fee (see § 1.492(a)). The 30-month time limit may not be extended." 37 C.F.R. § 1.495(b).*

WARNING: *If the translation of the international application and/or the oath or declaration have not been submitted by the applicant within thirty (30) months from the priority date, such requirements may be met within a time period set by the Office. 37 C.F.R. § 1.495(b)(2). The payment of the surcharge set forth in § 1.492(e) is required as a condition for accepting the oath or declaration later than thirty (30) months after the priority date. The payment of the processing fee set forth in § 1.492(f) is required for acceptance of an English translation later than thirty (30) months after the priority date. Failure to comply with these requirements will result in abandonment of the application. The provisions of § 1.136 apply to the period which is set. Notice of Jan. 3, 1993, 1147 O.G. 29 to 40.*

3. [x] A copy of the International application as filed (35 U.S.C. 371(c)(2)):

NOTE. *Section 1.495 (b) was amended to require that the basic national fee and a copy of the international application must be filed with the Office by 30 months from the priority date to avoid abandonment "The International Bureau normally provides the copy of the international application to the Office in accordance with PCT Article 20. At the same time, the International Bureau notifies applicant of the communication to the Office. In accordance with PCT Rule 47.1, that notice shall be accepted by all designated offices as conclusive evidence that the communication has duly taken place. Thus, if the applicant desires to enter the national stage, the applicant normally need only check to be sure the notice from the International Bureau has been received and then pay the basic national fee by 30 months from the priority date." Notice of Jan. 7, 1993, 1147 O.G. 29 to 40, at 35-36. See item 14c below.*

a. [ ] is transmitted herewith.
b. [ ] is not required, as the application was filed with the United States Receiving Office.
c. [x] has been transmitted
i. [x] by the International Bureau.
Date of mailing of the application (from form PCT/IB/308): _____.
ii. [ ] by applicant on _____.
Date

4. [x] A translation of the International application into the English language (35 U.S.C. 371(c)(2)):
a. [ ] is transmitted herewith.
b. [x] is not required as the application was filed in English.
c. [ ] was previously transmitted by applicant on _____.
Date
d. [ ] will follow.

5. [x] Amendments to the claims of the International application under PCT Article 19 (35 U.S.C. 371(c)(3)):

NOTE: The Notice of January 7, 1993 points out that 37 C F.R. § 1.495(a) was amended to clarify the existing and continuing practice that PCT Article 19 amendments must be submitted by 30 months from the priority date and this deadline may not be extended. The Notice further advises that: "The failure to do so will not result in loss of the subject matter of the PCT Article 19 amendments. Applicant may submit that subject matter in a preliminary amendment filed under section 1.121. In many cases, filing an amendment under section 1.121 is preferable since grammatical or idiomatic errors may be corrected." 1147 O.G. 29-40, at 36.

a. [ ] are transmitted herewith.
b. [ ] have been transmitted
   i. [ ] by the International Bureau.
   Date of mailing of the amendment (from form PCT/IB/308): _____.
   ii. [ ] by applicant on _____.
   Date
c. [x] have not been transmitted as
   i. [x] applicant chose not to make amendments under PCT Article 19.
   Date of mailing of Search Report (from form PCT/ISA/210):
   11 SEPTEMBER 2000.
   ii. [ ] the time limit for the submission of amendments has not yet expired. The amendments or a statement that amendments have not been made will be transmitted before the expiration of the time limit under PCT Rule 46.1.

6. [x] A translation of the amendments to the claims under PCT Article 19 (38 U.S.C. 371(c)(3)):
a. [ ] is transmitted herewith.
b. [ ] is not required as the amendments were made in the English language.
c. [x] has not been transmitted for reasons indicated at point 5(c) above.

7. [x] A copy of the international examination report (PCT/IPEA/409)
[x] is transmitted herewith.
[ ] is not required as the application was filed with the United States Receiving Office.

8. [x] Annex(es) to the international preliminary examination report
a. [x] is/are transmitted herewith.
b. [ ] is/are not required as the application was filed with the United States Receiving Office.

9. [x] A translation of the annexes to the international preliminary examination report
a. [] is transmitted herewith.
b. [X] is not required as the annexes are in the English language.

7/24/01

10. [x] An oath or declaration of the inventor (35 U.S.C. 371(c)(4)) complying with 35 U.S.C. 115
    a. [ ] was previously submitted by applicant on _____. Date
    b. [ ] is submitted herewith, and such oath or declaration
        i. [ ] is attached to the application.
        ii. [ ] identifies the application and any amendments under PCT Article 19 that were transmitted as stated in points 3(b) or 3(c) and 5(b); and states that they were reviewed by the inventor as required by 37 C.F.R. 1.70.
    c. [x] will follow.

Other document(s) or information included:

11. [x] An International Search Report (PCT/ISA/210) or Declaration under PCT Article 17(2)(a):
    a. [x] is transmitted herewith.
    b. [ ] has been transmitted by the International Bureau.
    Date of mailing (from form PCT/IB/308): _____.
    c. [ ] is not required, as the application was searched by the United States International Searching Authority.
    d. [ ] will be transmitted promptly upon request.
    e. [ ] has been submitted by applicant on _____. Date

12. [x] An Information Disclosure Statement under 37 C.F.R. 1.97 and 1.98:
    a. [ ] is transmitted herewith.
    Also transmitted herewith is/are:
    [ ] Form PTO-1449 (PTO/SB/08A and 08B).
    [ ] Copies of citations listed.
    b. [x] will be transmitted within THREE MONTHS of the date of submission of requirements under 35 U.S.C. 371(c).
    c. [ ] was previously submitted by applicant on _____. Date

13. [ ] An assignment document is transmitted herewith for recording.

A separate [ ] "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or [ ] FORM PTO 1595 is also attached.

_____
_____
_____

PCT/GB99/03950

14. [x] Additional documents:
    a. [ ] Copy of request (PCT/RO/101)
    b. [x] International Publication No. WO 00/45599
        i. [x] Specification, claims and drawing
        ii. [ ] Front page only
    c. [ ] Preliminary amendment (37 C.F.R. § 1.121)
    d. [x] Other

FORM PCT/IPEA/409; RESPONSE TO WRITTEN OPINION

15. [x] The above checked items are being transmitted
    a. [x] before 30 months from any claimed priority date.
    b. [ ] after 30 months.

16. [ ] Certain requirements under 35 U.S.C. 371 were previously submitted by the applicant on _____, namely:

AUTHORIZATION TO CHARGE ADDITIONAL FEES

WARNING: *Accurately count claims, especially multiple dependent claims, to avoid unexpected high charges if extra claims are authorized.*

NOTE: "A written request may be submitted in an application that is an authorization to treat any concurrent or future reply, requiring a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. An authorization to charge all required fees, fees under § 1.17, or all required extension of time fees will be treated as a constructive petition for an extension of time in any concurrent or future reply requiring a petition for an extension of time under this paragraph for its timely submission. Submission of the fee set forth in § 1.17(a) will also be treated as a constructive petition for an extension of time in any concurrent reply requiring a petition for an extension of time under this paragraph for its timely submission." 37 C.F.R. § 1.136(a)(3).

NOTE: "Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts; amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 C.F.R. § 1.26(a).

[X] The Commissioner is hereby authorized to charge the following additional fees that may be required by this paper and during the entire pendency of this application to Account No. 12-0425.

[X] 37 C.F.R. 1.492(a)(1), (2), (3), and (4) (filing fees)

WARNING: *Because failure to pay the national fee within 30 months without extension (37 C.F.R. § 1.495(b)(2)) results in abandonment of the application, it would be best to always check the above box.*

[ ] 37 C.F.R. 1.492(b), (c) and (d) (presentation of extra claims)

NOTE: Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must

only be paid or these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 C.F R. § 1.492(d)), it might be best not to authorize the PTO to charge additional claim fees, except possible when dealing with amendments after final action.

[X] 37 C.F.R. 1.17 (application processing fees)
[X] 37 C.F.R. 1.17(a)(1)-(5)(extension fees pursuant to § 1.136(a).
[X] 37 C.F.R. 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. 1.311(b))

NOTE: *Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 C.F.R. § 1.311(b).*

NOTE: *37 C.F.R. 1.28(b) requires "Notification of any change in loss of entitlement to small entity status must be filed in the application . . . prior to paying, or at the time of paying . . . issue fee." From the wording of 37 C.F.R. § 1.28(b): (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.*

[ ] 37 C.F.R. § 1.492(e) and (f) (surcharge fees for filing the declaration and/or filing an English translation of an International Application later than 30 months after the priority date).

SIGNATURE OF PRACTITIONER

Reg. No.: 25,858

WILLIAM R. EVANS
(type or print name of practitioner)

Tel. No.: (212) 708-1930

P.O. Address

Customer No.: 00140

c/o Ladas & Parry
26 West 61st Street
New York, N.Y. 10023

09/889966
Rec'd PCT/PTO 08 NOV 2001

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Patrick J. RAINSFORD

Serial No.: 09/889,966 Group No.: -

Filed: July 24, 2001 Examiner.: -

For: INTERACTIVE SYSTEM

Attorney Docket No.: U 013563-5

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

PRELIMINARY AMENDMENT

Please amend the application as follows:

IN THE CLAIMS

3. (Amended) An apparatus as claimed in claim 1, wherein said means for parsing include means for inputting criteria to be used to recognise a change of shot.

4. (Amended) An apparatus as claimed in claim 1, wherein the means for extracting attributes of the object includes means for isolating the object within a boundary formed on

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CERTIFICATE OF MAILING (37 CFR 1.8a)

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the United States Postal on the date shown below with sufficient postage as first class mail in an envelope addressed to the: Assistant Commissioner for Patents, Washington, D.C. 20231

CLIFFORD J. MASS
Type or print name of person mailing paper)

Date: August 30, 2001

(Signature of person mailing paper)

the frame, means for performing edge detection within the boundary to identify and locate edges of said object, and storing means for storing a geometric model of said object.

5. (Amended) An apparatus as claimed in claim 1, wherein said means for extracting attributes of said object also includes means for recording at least one of the attributes of shape, size, position, colour, texture, intensity gradient of said object, and time series statistics based on said attributes.

6. (Amended) An apparatus as claimed in claim 1, wherein said means for extracting attributes of said object includes means for comparing said attributes of said object with attributes of objects previously stored to determine whether the object is distinguishable therefrom, and when said object is determined not to be distinguishable, providing means for re-defining the object.

7. (Amended) An apparatus as claimed in claim 1, wherein said means for extracting attributes of said object includes means for comparing the location in the frame of said object with the location of objects already stored for that frame to determine whether that object is distinguishable therefrom, and where the location of said object is not distinguishable from the location of another object providing means for assigning rank to the objects to determine which object will be associated with that location.

8. (Amended) An apparatus, as claimed in claim 1, wherein the means for utilising the attributes of the object for tracking the object includes means for updating the stored attributes of the object as the attributes of the object change from frame to frame.

9. (Amended) An apparatus as claimed in claim 1, wherein said tracking means utilising the attributes of the object for tracking the object includes plural algorithm means for calculation of independent tracks of objects for use depending on the visual complexity of a sequence to automatically track said objects in different types of visual environment.

10. (Amended) An apparatus as claimed in claim 1, wherein said tracking means for utilising the attributes of the object for tracking the object includes means for converting all the frames to be tracked to a low-level representation, means for determining the position of each object in the frames by minimising a distance measure to locate each object in each frame, means for processing the positions of said object to smooth over occlusions and the entrances and exits of objects into and out of said frames, and means for reviewing the object within a tracked sequence and for correcting the location attributes of any misplaced objects.

11. (Amended) An apparatus, as claimed in claim 1, wherein the means for associating interactive data with the object in the key-frame includes means for providing a database of different types of data including one or more of URLs, HTML pages, video clips, audio clips, text files and multimedia catalogues, and means for selecting said interactive content data from the database to associate with said object.

12. (Amended) An apparatus, as claimed in claim 1, wherein the means for associating interactive data with the object in the key-frame produces said data sequence using means for determining whether the embedded interactive content data is frame synchronous data associated with object positions, shapes, ranks and pointers in a frame, or group-synchronous data associated with all the objects in a group, or is data to be streamed just in time, wherein means are provided for associating frame synchronous data with the corresponding frame, means are provided for associating group synchronous data with the frame at which a group changes, and means are provided for streaming just in time data to a user before

it is required to be associated with the corresponding objects.

13. (Amended) An apparatus as claimed in claim 1, wherein means are provided to associate different interactive content data with respectively different objects.

16. (Amended) A method as claimed in claim 14, wherein step c) includes the step of producing a hierarchy of groups of sequences of shots.

17. (Amended) A method as claimed in claim 14, wherein step e) includes the steps of: isolating the object within a boundary formed on the frame, performing edge detection within the boundary to identify and locate edges of said object, and step f) includes storing a geometric model of said object.

18. (Amended) A method as claimed in claim 14, wherein step f) includes the step of recording at least one of the attributes of shape, size, position, colour, texture, intensity gradient of said object, and time series statistics based on said attributes.

19. (Amended) A method as claimed in claim 14, wherein step f) includes the step of comparing said attributes of said object with attributes of objects previously stored to determine whether the object is distinguishable therefrom, and when said object is determined not to be distinguishable, the step of redefining the object.

20. (Amended) A method as claimed in claim 14, wherein step f) includes the step of comparing the location in the frame of said object with the location of objects already stored for that frame to determine whether that object is distinguishable therefrom, and where the location of said object is not distinguishable from the location of another object, the step of assigning rank to the objects to determine which object will be associated with that location.

21. (Amended) A method, as claimed in claim 14, wherein step h) includes the step of updating the stored attributes of the object as the attributes of the object change from frame to frame.

22. (Amended) A method as claimed in claims 14, wherein step h) includes the step of using plural algorithm means for calculation of independent tracks of objects for use depending on the visual complexity of a sequence automatically to track said objects in different types of visual environment.

23. (Amended) A method as claimed in claim 14, wherein step h) includes the steps of converting all the frames to be tracked to a low-level representation, determining the position of each object in the frames by minimising a distance measure to locate each object in each frame, processing the positions of said object to smooth over occlusions and the entrances and exits of objects into and out of said frames, reviewing the object within a tracked sequence and correcting the location attributes of any misplaced objects.

24. (Amended) A method, as claimed in claim 14, wherein step g) includes the steps of providing a database of different types of data including one or more of URLs, HTML pages, video clips, audio clips, text files and multimedia catalogues, and selecting said interactive content data from the database to associate with said object.

25. (Amended) A method, as claimed in claim 14, wherein step j) includes determining whether the embedded interactive content data is frame synchronous data associated with object positions, shapes, ranks and pointers in a frame, or group-synchronous data associated with all the objects in a group, or is data to be streamed just in time, and associating frame synchronous data with the corresponding frame, associating group synchronous data with the frame at which a group changes, and streaming just in time data to a user before it is required to be associated with the corresponding objects,

respectively.

26. (Amended) A method as claimed in claim 14, wherein in steps d) to j) different interactive content data are associated with respectively different objects.

27. (Amended) A computer program comprising code means for performing all the steps of the method of claim 14 when the program is run on one or more computers.

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REMARKS

The above amendatory action is taken solely for the purpose of avoiding claim fees that would otherwise accrue due to the presence of multiple dependent claims.

Respectfully submitted,

Clifford J. Mass
c/o Ladas & Parry
26 West 61st Street
New York, New York 10023
Reg. No. 30,086 Tel. No. (212) 708-1890

MARKED-UP COPY

3. (Amended) An apparatus as claimed in [claims] claim 1 [or 2], wherein said means for parsing include means for inputting criteria to be used to recognise a change of shot.

4. (Amended) An apparatus as claimed in [any of claims] claim 1, [to 3] wherein the means for extracting attributes of the object includes means for isolating the object within a boundary formed on the frame, means for performing edge detection within the boundary to identify and locate edges of said object, and storing means for storing a geometric model of said object.

5. (Amended) An apparatus as claimed in [any of claims] claim 1, [to 4] wherein said means for extracting attributes of said object also includes means for recording at least one of the attributes of shape, size, position, colour, texture, intensity gradient of said object, and time series statistics based on said attributes.

6. (Amended) An apparatus as claimed in [any of the preceding claims] claim 1, wherein said means for extracting attributes of said object includes means for comparing said attributes of said object with attributes of objects previously stored to determine whether the object is distinguishable therefrom, and when said object is determined not to be distinguishable, providing means for re-defining the object.

7. (Amended) An apparatus as claimed in [any of the preceding claims] claim 1, wherein said means for extracting attributes of said object includes means for comparing the location in the frame of said object with the location of objects already stored for that frame to determine whether that object is distinguishable therefrom, and where the location of said object is not distinguishable from the location of another object providing means for assigning rank to the objects to determine which object will be associated with that location.

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8. (Amended) An apparatus, as claimed in [any of the preceding claims] claim 1, wherein the means for utilising the attributes of the object for tracking the object includes means for updating the stored attributes of the object as the attributes of the object change from frame to frame.

9. (Amended) An apparatus as claimed in [any of the preceding claims] claim 1, wherein said tracking means utilising the attributes of the object for tracking the object includes plural algorithm means for calculation of independent tracks of objects for use depending on the visual complexity of a sequence to automatically track said objects in different types of visual environment.

10. (Amended) An apparatus as claimed in [any of the preceding claims] claim 1, wherein said tracking means for utilising the attributes of the object for tracking the object includes means for converting all the frames to be tracked to a low-level representation, means for determining the position of each object in the frames by minimising a distance measure to locate each object in each frame, means for processing the positions of said object to smooth over occlusions and the entrances and exits of objects into and out of said frames, and means for reviewing the object within a tracked sequence and for correcting the location attributes of any misplaced objects.

11. (Amended) An apparatus, as claimed in [any of the preceding claims] claim 1, wherein the means for associating interactive data with the object in the key-frame includes means for providing a database of different types of data including one or more of URLs, HTML pages, video clips, audio clips, text files and multimedia catalogues, and means for selecting said interactive content data from the database to associate with said object.

12. (Amended) An apparatus, as claimed in [any of the preceding claims] claim 1, wherein the means for associating interactive data with the object in the key-frame produces said data sequence using means for determining whether the embedded interactive content data is frame

synchronous data associated with object positions, shapes, ranks and pointers in a frame, or group-synchronous data associated with all the objects in a group, or is data to be streamed just in time, wherein means are provided for associating frame synchronous data with the corresponding frame, means are provided for associating group synchronous data with the frame at which a group changes, and means are provided for streaming just in time data to a user before it is required to be associated with the corresponding objects.

13. (Amended) An apparatus as claimed in [any of the preceding claims] claim 1, wherein means are provided to associate different interactive content data with respectively different objects.

16. (Amended) A method as claimed in [claims] claim 14, [to 16] wherein step c) includes the step of producing a hierarchy of groups of sequences of shots.

17. (Amended) A method as claimed in [any of claims] claim 14, [to 16] wherein step e) includes the steps of: isolating the object within a boundary formed on the frame, performing edge detection within the boundary to identify and locate edges of said object, and step f) includes storing a geometric model of said object.

18. (Amended) A method as claimed in [any of claims] claim 14, [to 17] wherein step f) includes the step of recording at least one of the attributes of shape, size, position, colour, texture, intensity gradient of said object, and time series statistics based on said attributes.

19. (Amended) A method as claimed in [any of claims] claim 14, [to 18] wherein step f) includes the step of comparing said attributes of said object with attributes of objects previously stored to determine whether the object is distinguishable therefrom, and when said object is determined not to be distinguishable, the step of redefining the object.

EP 0 898 245 A2

20. (Amended) A method as claimed in [any of claims] claim 14, [to 19] wherein step f) includes the step of comparing the location in the frame of said object with the location of objects already stored for that frame to determine whether that object is distinguishable therefrom, and where the location of said object is not distinguishable from the location of another object, the step of assigning rank to the objects to determine which object will be associated with that location.

21. (Amended) A method, as claimed in [any of claims] claim 14, [to 20] wherein step h) includes the step of updating the stored attributes of the object as the attributes of the object change from frame to frame.

22. (Amended) A method as claimed in [any of claims] claim 14, [to 21] wherein step h) includes the step of using plural algorithm means for calculation of independent tracks of objects for use depending on the visual complexity of a sequence automatically to track said objects in different types of visual environment.

23. (Amended) A method as claimed in [any of claims] claim 14, [to 22] wherein step h) includes the steps of converting all the frames to be tracked to a low-level representation, determining the position of each object in the frames by minimising a distance measure to locate each object in each frame, processing the positions of said object to smooth over occlusions and the entrances and exits of objects into and out of said frames, reviewing the object within a tracked sequence and correcting the location attributes of any misplaced objects.

24. (Amended) A method, as claimed in [any of claims] claim 14, [to 23] wherein step g) includes the steps of providing a database of different types of data including one or more of URLs, HTML pages, video clips, audio clips, text files and multimedia catalogues, and selecting said interactive content data from the database to associate with said object.

25. (Amended) A method, as claimed in [any of claims] claim 14, [to 24] wherein step j) includes determining whether the embedded interactive content data is frame synchronous data associated with object positions, shapes, ranks and pointers in a frame, or group-synchronous data associated with all the objects in a group, or is data to be streamed just in time, and associating frame synchronous data with the corresponding frame, associating group
synchronous data with the frame at which a group changes, and streaming just in time data to a user before it is required to be associated with the corresponding objects,
respectively.

26. (Amended) A method as claimed in [any of claims] claim 14, [to 25] wherein in steps d) to j) different interactive content data are associated with respectively different objects.

27. (Amended) A computer program comprising code means for performing all the steps of the method of [any of claims] claim 14 [to 26] when the program is run on one or more computers.

09/889966

Rec'd PCT/PTO 08 NOV 2001

Practitioner's Docket No. U 013563-5 ***PATENT***

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

[x] In re application of: Patrick J. **RAINSFORD**
Application No.: 09/889,966 Group No.: - -
Filed: July 24, 2001 Examiner: - -
For: INTERACTIVE SYSTEM

[ ] *Patent No.: Issue Date:

**NOTE: Insert name(s) of inventor(s) and title also for patent Where statement is with respect to a maintenance fee payment, also insert application number and filing date, and add Box M. Fee to address.*

STATEMENT CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(c-f) and 1.27(b-d))

With respect to the invention described in
[ ] the specification filed herewith.
[x] application no. 09/889,966, filed July 24, 2001.
[ ] patent no. _____ issued _____.

I. IDENTIFICATION AND RIGHTS AS A SMALL ENTITY

I hereby state that I am

(complete either (a), (b), (c) or (d) below)

(a) Independent Inventor

[ ] a below named independent inventor, and that I qualify as an independent inventor, as defined in 37 CFR 1.9(c), for purposes of paying reduced fees under Sections 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office.

(b) Noninventor Supporting a Claim by Another

[ ] making this statement to support a claim by

---

for a small entity status for purposes of paying reduced fees under Sections 41(a) and (b) of Title 35, United States Code. I hereby state that I would qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees under Sections 41(a) and (b) of Title 35, United States Code, if I had made the above identified invention.

(c) Small Business Concern

[ ] the owner of the small business concern identified below:

check one → [ ] an official of the small business concern empowered to act on behalf of the concern identified below:

Name of Concern EMUSE CORPORATION
Address of Concern 80 Park Avenue, Sandymount, Dublin 4, IRELAND
and

that the above identified small business concern qualifies as a small business concern, as defined in 13 CFR 121.3-18, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees under Sections 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

(d) Non-Profit Organization

[ ] an official empowered to act on behalf of the nonprofit organization identified below:

Name of Organization _____
Address of Organization _____

TYPE OF ORGANIZATION

[ ] University or Other Institution of Higher Education

[ ] Tax Exempt Under Internal Revenue Service Code (26 USC 501(a) and 501(c) (3))

[ ] Nonprofit Scientific or Educational Under Statute of State of the United States of America
(Name of State_____)
(Citation of Statute_____)

[ ] Would Qualify as Tax Exempt Under Internal Revenue Service Code (26 USC 501(a) and 501(c) (3)), if Located in the United States of America

[ ] Would Qualify as Nonprofit Scientific or Educational Under Statute of State of the United States of America, if Located in the United States of America
(Name of State_____)
(Citation of Statute_____)

and that the nonprofit organization identified above qualifies as a nonprofit organization, as defined in 37 CFR 1.9(e), for purposes of paying reduced fees under Sections 41(a) and (b) of Title 35, United States Code.

II. OWNERSHIP OF INVENTION BY DECLARANT

I hereby state that rights under contract or law remain with and/or have been conveyed to the above identified

[ ] person	[x] concern	[ ] organization
(item (a) or (b) above)	(item (c) above)	(item (d) above)

EXCEPT, that if the rights held are not exclusive, each individual, concern or organization having rights to the invention is listed below* and no rights to the invention are held (1) by any person who could not be classified as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, (2) any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or (3) a nonprofit organization under 37 CFR 1.9(e).

[x] no such person, concern, or organization
[ ] person, concerns or organizations listed below*

**NOTE: Separate statements are required from each named person, concern or organization having rights to the invention as to their status as small entities. (37 CFR 1.27)*

Full Name _____
Address _____
[ ] INDIVIDUAL [ ] SMALL BUSINESS CONCERN [ ] NONPROFIT ORGANIZATION

Full Name _____
Address _____
[ ] INDIVIDUAL [ ] SMALL BUSINESS CONCERN [ ] NONPROFIT ORGANIZATION

III. ACKNOWLEDGEMENT OF DUTY TO NOTIFY PTO OF STATUS CHANGE

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

IV. DECLARATION

(check the following item, if desired)

NOTE: The following verification statement need not be made in accordance with the rules published on October 10, 1997, 62 Fed. Reg. 52131, effective December 1, 1997.

NOTE: "The presentation to the Office (whether by signing, filing, submitting, or later advocating) of any paper by a party, whether a practitioner or non-practitioner, constitutes a certification under § 10.18(b) of this chapter. Violations of § 10.18(b)(2) of this chapter by a party, whether a practitioner or non-practitioner, may result in the imposition of sanctions under § 10.18(c) of this chapter. Any practitioner violating § 10.18(b) may also be subject to disciplinary action. See §§ 10.18(d) and 10.23(c)(15)." 37 CFR 1.4(d)(2).

[ ] I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

V. SIGNATURES

(complete only (e) or (f) below)

(e)
NOTE: All inventors must sign the statement.

_____
Name of Inventor

_____ Date: _____
Signature of Inventor

_____
Name of Inventor

_____ Date: _____
Signature of Inventor

_____
Name of Inventor

_____ Date: _____
Signature of Inventor

(add lines for any additional inventors who must sign)

or

(f)
NOTE: The title of the person signing on behalf of a concern or nonprofit organization should be specified.

Name of Person Signing (x) [signature] OCT 2 2 2001

Title of Person (x) C.E.O.
(if signing on behalf of a concern or non-profit organization)

Address of Person Signing Emuse Corporation, 80 Park Avenue, Sandymount, Dublin 4, IRELAND

SIGNATURE (x) _____ DATE (x) _____

9/PRTS

09/889966
JC18 Rec'd PCT/PTO 2 4 JUL 2001

INTERACTIVE SYSTEM

This invention relates to an interactive system and particularly to a system for multiplexing data in a digital video signal.

It is known to provide a video programme in the form of a digital signal which may be broadcast, or which may be provided on a digital video disk (DVD) or a video tape and the present invention is not restricted to the form in which the video signal for a programme is provided.

With the increasing number of television broadcasting channels, there is a dilution of advertising revenue since, for commercial reasons, an advertiser restricts their marketing effort to a limited number of broadcast channels. In addition, there is an increase in availability of devices available to a viewer for preventing the reception of unwanted advertisements, e.g. a V-chip, but at the present time there is currently no way of selectively blocking advertisements, with the result that those advertisements that may be of interest to a viewer are also blocked.

With the growing use of the Internet, users are becoming accustomed to having access to large and diverse sources of data and information using a personal computer (PC) or, for example, a digital set-top box used in conjunction with a television and remote control or mouse.

The present invention seeks to provide a system which enables a viewer to interact with a video signal which may be broadcast so as to facilitate information transfer and/or transactions that may be performed over the Internet.

According to one aspect of this invention there is provided an interactive system including means for providing a video programme signal, means for generating interactive content data associated with at least one object, said data being associated with frames of said video programme signal in which the object appears, means for multiplexing said data with said video programme signal, means for viewing the video programme signal,

means for retrieving said data and means for using said data to obtain details of said object.

Preferably, said means for using include means for accessing an interactive Web site to obtain said details of said object. Conveniently, said means for using further include means for producing a list of details of said object and means for selecting from said list.

Advantageously, said means for accessing an interactive Web site is adapted to secure details of said object which may include a purchasing transaction for said object or browsing an advertising catalogue.

Preferably, the means for generating includes means for tracking said object in each frame of said video programme signal in which said object appears and means for identifying the location of said object in each said frame.

Preferably, each frame of said video programme includes said interactive content data.

Advantageously, said tracking means includes means for determining scene breaks and means for searching for said object in a next frame in which said object appears.

Conveniently, said multiplexing means includes means for synchronising said data with audio and video data of said programme signal to generate a transport stream, for example, a MPEG-2/DVB transport stream.

Advantageously, said system includes means for broadcasting said transport stream via, for example, at least one of a satellite, terrestrial and cable network.

Conveniently, said means for retrieving includes one of a mouse, a keyboard, and remote control device.

According to a second aspect of this invention there is provided apparatus for associating data representative of an object with a digital video programme including means for providing a digital video programme having plural individual frames at least some of which incorporate said object, means for selecting a frame of the video programme in which said object appears to provide a key-frame, means for selecting said object within the key-frame with which data is to be associated, means

for extracting attributes of the object from the key-frame, means for associating interactive data with the object in the key-frame, means for utilising the attributes of the object for tracking the object through subsequent frames of the video programme, whereby said interactive data is associated with the object in subsequent frames of the video programme in which said object has been tracked and said interactive content data is embedded with data representative of said object in a data sequence.

Advantageously, means are provided for converting said data sequence to a standard data sequence, for example, an MPEG-2/DVB compliant data sequence.

Where the video programme is in an analogue format means are preferably provided for converting the programme to digitised form.

Preferably, the means for selecting a frame of the video programme includes means for producing an edit list to divide the digitised video programme into a plurality of sequences of related shots, and means for selecting at least one key-frame from within each sequence.

Advantageously, the means for producing an edit list further includes means for parsing the video programme by identifying separate shots in the video programme to produce the edit list, means for identifying shots containing related content to form a sequence of shots containing related content, and means for producing a hierarchy of groups of shots.

Advantageously, said means for parsing include means for inputting criteria to be used to recognise a change of shot.

Preferably, the means for extracting attributes of the object includes means for isolating the object within a boundary formed on the frame, means for performing edge detection within the boundary to identify and locate edges of said object, and storing means for storing a geometric model of said object.

Conveniently, said means for extracting attributes of said object also includes means for recording at least one of the attributes of shape, size, position, colour, texture, intensity

gradient of said object, and time series statistics based on said attributes.

Advantageously, said means for extracting attributes of said object includes means for comparing said attributes of said object with attributes of objects previously stored to determine whether the object is distinguishable therefrom, and when said object is determined not to be distinguishable, providing means for re-defining the object, for example by re-defining said boundary.

Preferably, said means for extracting said attributes includes means for comparing the location in the frame of said object with the location of objects already stored for that frame to determine whether that object is distinguishable therefrom, and where the location of said object is not distinguishable from the location of another object providing means for assigning rank to the objects to determine which object will be associated with that location.

Preferably, the means for tracking the object includes means for updating the stored attributes of the object as the object moves location within different frames.

Advantageously, said means for tracking includes plural algorithm means for use depending on the visual complexity of a sequence to automatically track objects in different types of visual environment.

Advantageously, said tracking means includes means for converting all the frames to be tracked to a low-level representation, means for determining the position of each object in the frames by minimising a distance measure to locate each object in each frame, means for processing the positions of said object to smooth over occlusions and the entrances and exits of objects into and out of said frames, and means for reviewing the object within a tracked sequence and for correcting the location attributes of any misplaced objects.

Preferably, the means for associating includes means for providing a database of different types of data including one or more of URLs, HTML pages, video clips, audio clips, text files and multimedia catalogues, and means for selecting said

interactive content data from the database to associate with said object.

Preferably, the means for associating produces said data sequence using means for determining whether the embedded interactive content data is frame synchronous data associated with object positions, shapes, ranks and pointers in a frame, or group-synchronous data associated with all the objects in a group, or is data to be streamed just in time, wherein means are provided for associating frame synchronous data with the corresponding frame, means are provided for associating group synchronous data with the frame at which a group changes, and means are provided for streaming just in time data to a user before it is required to be associated with the corresponding objects.

It will be understood that although the above has been defined in relation to associating interactive content data with one object, different interactive content data may be associated with respectively different objects.

According to a third aspect of this invention there is provided apparatus for embedding a data sequence within a generic digital transport stream (such as DVB/MPEG-2 or ATSC/MPEG-2) including means for receiving a data sequence of interactive content data associated with an object in a digitised video signal, means for synchronising the data sequence with the video and audio of the digitised video signal to generate a further transport stream, and means for associating a packet identifier with the further transport stream.

In a preferred embodiment, means are provided for broadcasting the further transport stream to viewers.

Preferably, the means for receiving a data sequence includes means for receiving elementary streams comprising a digital video signal stream, a digital audio stream, a digital data sequence stream and a digital control data stream, means for packetising each of the data streams into fixed size blocks and adding a protocol header to produce packetised elementary streams, and means for synchronising the packetised elementary streams with time stamps to establish a relationship between the data streams.

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Preferably, the means for synchronising the data sequence includes means for multiplexing packetised elementary streams into transport packets headed by a synchronisation byte, and means for assigning a different packet identifier to each packetised elementary stream.

Advantageously, means for synchronising the packetised elementary streams with time stamps includes means for stamping with a reference time stamp to indicate current time, and means for stamping with a decoding time stamp to indicate when the data sequence stream has to be synchronised with the video and audio streams.

Conveniently, the means for broadcasting the further transport stream to users includes means for providing a programme association table listing all the channels to be available in the broadcast, means for providing a programme map table identifying all the elementary streams in the broadcast channel, and means for transmitting the programme association table and the programme map table as separate packets within the further transport stream.

According to a fourth aspect of this invention there is provided apparatus for retrieving data embedded in a generic digital transport stream in which the embedded data includes a data sequence of data associated with objects represented by the generic digital transport stream, said apparatus including means for recognising a packet identifier within the video signal, means for extracting the data sequence from the generic digital transport stream, means for identifying objects within the video sequence from which to retrieve associated data, means for synchronising said data sequence to said identified objects and means for interactively using said associated data.

Preferably, said means for identifying objects includes means for selecting an object within a frame, means for displaying data associated with said object, means for selecting data from a list of displayed data, and means for extracting the embedded data associated with the data relating to said object.

Conveniently, means are provided for selecting a frame to display the objects having embedded associated data, means for

selecting one of the displayed objects to display a list of the data associated with said object, and means for selecting from said list.

Conveniently, the means for selecting includes means for storing the frame for subsequent display and subsequent recall of the frame.

In a preferred embodiment, the extracted embedded data is applied to means for accessing an Internet web site to facilitate interactive communication such as e-commerce.

By using the present invention, advertisements produced by advertisers are unobtrusive, i.e. the viewer can watch the programme without interacting, if so desired. Alternatively, the viewer can view the programme and freeze a frame of the programme, click on an object using a mouse, keyboard or TV remote control and, over the Internet, facilitate an e-commerce transaction. In performing such a function the viewer may split the VDU screen so that one portion continues to display the running programme and another portion displays the frozen frame and the Internet information transfer.

The invention can be used in numerous aspects of digital video entertainment, especially broadcasting, i.e.

1. Interactive product placement in regular television programmes or movies.
2. Fashion TV.
3. Music TV.
4. Educational programmes.

The e-commerce may facilitate, for example, merchandising to ticket sales.

The invention has the advantage that a viewer is able to select further information on those items of interest within a video signal programme without being overwhelmed with information of no relevance. This is particularly useful where the information is in the form of advertisements and is achieved by making objects viewed in the video programme have associated multiplexed (embedded) data to provide links to further information relevant to those objects, either to information

within the video signal or stored in a database or by accessing an Internet web site.

As far as the advertiser is concerned, the invention has the advantage that advertisements can be precisely targeted to a relevant audience and the advertisements cannot be stopped from reaching the user by a device for blocking out advertisements, e.g. a V-chip. Because multiple advertisers may associate their advertisements with each frame of a video programme sequence, the invention has the potential of reducing the costs of advertising to individual advertisers while maintaining or increasing advertising revenues for programme makers and suppliers. In this way, data-carrying potential of each frame of a video programme signal may be maximised and maximum use of the data-carrying capacity of broadcast channels may be achieved. The present invention is believed to lead the way to generating a new democracy for advertisers that may not be able to afford, for example, a two minute segment on broadcast TV at peak times. This is because the present invention allows multiple advertisers per object, and/or multiple objects per frame, leading to a high level of flexibility in advertising revenue models.

In the field of, for example, music videos, the content may be used to promote the music of the band for the record label and by interacting with the musicians, a user may purchase and download the music directly.

Additionally, plural advertisers may be buying the same slot - in other words, the advertiser's content is totally fused within the programme content and it is not until the advertising content is downloaded by the user that it is read. Thus, every frame of a digital TV programme may be used as advertising revenue. An e-commerce database may store all relevant data concerning the advertisers, from URL addresses of Web sites to catalogues, brochures and video promotions, to e-commerce transaction facilities.

When a viewer selects an object by, for example, using a mouse to click on the object, that object may represent a number of advertisers, e.g. a musician may advertise clothing, a watch, cosmetics, and a musical instrument, so that the viewer selects

from a list of promoted items associated with the object. There is, thus, presented a push technology approach which maximises the transmission speed of a satellite broadcast. The user needs only a return path via the Internet if he actually wishes to carry out a transaction.

The invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 shows a block schematic diagram of an interactive system of this invention,

Figure 2 shows a block schematic diagram of video programme processing for generating interactive content data associated with an object in relevant frames of a programme,

Figure 3 shows a schematic diagram indicating programme sequences derived by groups of related camera shots,

Figure 4 shows a block schematic diagram of a parser shown in Figure 2, whereby groups of shots are produced,

Figure 5 shows a key frame of a video programme,

Figure 6 shows an object selected in the key frame of Figure 5,

Figure 7 shows a flow diagram for frame by frame identification of objects in a video programme,

Figure 8 shows a flow diagram of the object tracker shown in Figure 2 for tracking the object frame by frame,

Figure 9 shows a flow diagram of the streamer shown in Figure 2,

Figure 10 shows a block schematic diagram for combining the interactive content data with the video programme signal,

Figure 11 shows the structure of a data packet used in this invention, and

Figure 12 shows in block schematic form the manner of extracting the interactive content data from the video programme signal.

In the Figures like reference numerals denote like parts.

The interactive system shown in Figure 1 has apparatus 200 for producing a data sequence that is representative of interactive content data associated with at least one object which is multiplexed 1080 with video and audio data

representative of the digital video programme. In the described embodiment, a data transport stream 1001 is applied to head end apparatus 10 of a satellite broadcast device 20 that transmits to a satellite 25 that, in turn, re-transmits the broadcast signal to plural users/viewers 30 each having a respect broadcast receiving dish 31. The received signal may be applied to a PC 40 having a TV card for interaction by a viewer. The received broadcast signal may also, or alternatively, be applied to a set top box 50 of a digital television 55 or a television with integrated set top box electronics. The set top box may be provided with a keyboard (not shown) or a mouse 56 for a viewer to manipulate an icon on the TV to select objects and interact with menus and operations that may be provided. The PC 40 may similarly be provided with a keyboard, but, as is customary, also a mouse so that the manner of use is the same as the set top box, so a viewer/user is able to select an object and perform interactive communication. Input and output to and from the PC is via a modem 45 to a public telephone network 60 which may be, for example, PSTN, ISTN, xDSL, or satellite, and the set top box 50 is similarly connected to the network 60. The network 60 interconnects the multiple viewers with an e-commerce management system 70 that may be a dedicated management system or a system inter-linked with an Internet service provider. In a system where a video programme is broadcast, the system 70 is connected to the broadcast providing system so that the system 70 can tie-in with the broadcast programme for maintaining a reference between the objects transmitted to a viewer.

In the system of this invention an object which may be, for example, a person, physical objects such as clothing, a watch, cosmetics, musical instruments or, for example, a trademark has data associated with that object multiplexed (embedded) into the video programme signal of the programme that carries the object. To achieve this it is necessary to identify and track objects frame by frame throughout the video programme. It is to be understood that although in the described embodiment the video programme is broadcast, the video programme could be on a digital video disk (DVD), tape or any known means for storing a video

programme. The viewer upon selecting an object is then able to interact with details concerning the object. For example, where the object is a musician in a pop musical video, information may be derived as to where the music record, clothing worn and advertised by the musician may be secured over the Internet.

The first stage is to produce the interactive data that will be dynamically associated with the, or each, object in every frame of a programme in which the object appears. A five-minute video sequence, for example, will typically consist of 7,500 frames, whereas a ninety-minute movie may be 135,000 frames.

If the input video programme is not in a digital format, the programme must first be digitised by means known per se.

Referring to Figure 2, the apparatus 200 for generating the interactive content data associated with an object in relevant frames of a programme is shown. The digitised programme from a digital video source 201 is divided into related shots 300 (shown in Figure 3) by a parser 400, shown in detail in Figure 4. In the context of this invention a "shot" is a single camera "take" of a scene. A five-minute video sequence may typically have one hundred such shots or edits consisting of a series of frames Fn where, for example, Fn = 25 x 60 x 5 = 7,500 frames, whereas a ninety-minute video may have thousands of shots. If the digitised video programme is supplied with an optional edit list 202, which edit list indicates at which frames the shots 300 change, this may be utilised to divide the programme into the separate shots 300.

Basically, the parser 400 deconstructs the video into a group of sequences 321, 322, 323 (Figure 3). The sequences consist of a series of semantically related shots and, for example, one sequence may contain all the shots that feature the lead singer in a pop music video. Therefore, the function of the parser 400 is to deconstruct the programme into sequences unified by a common thread. The operation is necessary so that the tracker 800, described hereinafter, will only search for objects in sequences where they are likely to be found. The parser 400 detects shot changes, camera angle changes, wipes, dissolves and any other possible editing function or optical transition effect.

The parser 400 shown in Figure 4 receives the digital programme and the end of a shot is detected 410, e.g. by comparing edge maps of each successive frame of the video programme and stipulating that an end of shot occurs when a change in location of the edge map occurs which exceeds a predetermined threshold. The criteria 420 to be used to determine the end of a shot is input into the cut/shot detection programme by a user who is embedding data associated with an object into the video programme sequence. Information of different shots is put into an edit list 430.

A number of frames are then selected in a key-frame identifier 440 from each shot 300 to become key-frames 500 (see also Figure 5) which are representative of that shot 300. More than one key-frame may be needed for each shot where the shot 300 includes, for example, complex camera moves, such as pans or zooms, so that one key-frame 500 is not representative of the total content. Furthermore, if the video programme is of a pop group, and the sequence starts with a long shot of all the band members and speedily zooms onto the lead singer and ends with the lead singer's face filling the screen, no single frame would be representative of the whole shot, but a valid selection of three key-frames would be, for example, the first frame 311, a frame 312 about half-way through the zoom, and a final frame 313 (shown in Figure 3). Thus, key-frames 311, 312 and 313 are automatically selected which are representative of the video content of the shot 300.

As shown in Figures 3 and 4, the shots 300 are grouped into sequences by a scene grouper 450 which compares the key-frames 311 - 313 from each shot 300 with the key-frames 311 - 313 from each others shot 304, 307. This is performed by comparing the key-frames from the shots using low level features such as colour correlelograms, data maps and textures. Shots that have similar content are grouped together into a hierarchical structure by the scene grouper 450 into groups of shots having a common theme. For example, in a pop music video, it may be that there are several different sets used, but one set may appear in many places in the video. The scene grouper 450 groups sequences of

the shots 300, 304, 307 using the same set on one level and similar types of shots/sequences of the same set at another level. In this way, a hierarchical structure, termed a content tree 460, of sequences is built up. The purpose of the grouping is to aid in the selection of objects to be identified by interactive content data and also improve the efficiency of the subsequent tracking of the selected object through the video programme (described hereinafter) by ensuring that searching for a particular object is carried out only within related shots 300, 304, 307 and not through all shots of the film. The parser 400 thus assists the user to grasp the full structure and complexity of the video programme by providing a powerful browsing and object selection device as well as increasing the efficiency of the tracker by limiting tracking of an object to related shots, i.e. shots in sequences 321, 322, 323.

Having grouped the shots 300 into sequences 321, 322, 323, sequence key-frames are selected from the key-frames 311, 312, 313 of each shot to represent the sequence. A user wishing to input interactive content data representative of an object into a video programme may then use these high level key-frames to select those sequences of shots which contain objects of interest to the user. These key-frames are preferably presented to the user in a form representing the hierarchical structure in the content tree 460 of the sequences 321, 322, 323. An output 470 of the scene grouper 450 is a number of sequences of single shots, key-frame 311, 312, 313 representing the sequences and a content tree showing the hierarchical relationship between the sequences, as reflected by the key-frames.

The user intending to insert the interactive content data into the video programme views the hierarchical structure of the key frames and selects a first key-frame 311, as shown in Figure 5. In a preferred embodiment, all the key-frames may be presented to a user on a screen in miniaturised form and the user may position a cursor over the miniaturised key frame and select that key-frame. A full-sized version of the key-frame may then be presented to the user for selection of objects from the key frame 311. The user then marks with a pointing device, such as a

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mouse, an object 600 within the key-frame 311 which the user intends to associate with interactive content data embedded in the programme video (as shown in Figure 6). The object may be marked by drawing a boundary box 610 around the object. To select the object 600 in the key-frame 311, the user clicks a mouse button when the cursor is at the top left corner and drags the mouse cursor to the bottom right corner of the object 600 so that the boundary box 610 is displayed around the selected object 600.

For example, to embed data information about a pop group tour date, the entire key-frame may be selected. If the key-frame contains a keyboard then the keyboard may be selected to advertise the keyboard and/or sell the keyboard on behalf of the keyboard manufacturer. Also, the lead singer who appears in the key-frame may also be selected. The boundary box shown in Figure 6 is rectangular, which is a preferred default shape, but other shapes may be used such as a parallelogram or a user defined polygon.

The selection of objects is made and the object identified 600, as shown in detail in Figure 7. Thus, the user-identifies objects 710, points to and clicks on the object 600 to provide initial object choices 715. As each object 600 is selected in the key-frame 311, attributes used to track the object through successive frames are calculated and compared with the attributes of objects already recorded 720 to ensure that the new object is distinctly different from all other objects already recorded for that frame. These attributes may include any of shape, size, position, colour, texture and intensity gradient of the object, as well as time series statistics based on these attributes. If a new object is too similar to previously recorded objects, the user is prompted for extra information about the new object. Otherwise, the attributes of the object are recorded.

The selected object in block 725 is viewed isolated from the rest of the frame. The user may then change the boundary box 610 to define the object 600 by discriminating 730 against other objects more precisely, or if two objects overlap so that they occupy the same location on the screen, the user may indicate

which object takes precedence by assigning a rank to each of the overlapping objects. For instance, in the example given above, information on the group's tour dates, which is associated with a whole frame, may be given a low rank so that, for example, any other object appearing anywhere in the frame will always have a higher rank and not be overridden by the data associated with the whole frame 311. This process is repeated for each of the key-frames 311 representing each of the sequences 321, 322, 323.

As each object is selected in the key-frame, the next step is to identify the object using data and embed the date with the object. Preferably, record addresses of data are held in a database, the data being associated with a particular object or, alternatively, instead of using a record address, the data itself may be embedded. Preferably, a graphical user interface 750 is used to drag an icon representing the data onto the object 600 within the frame 311.

Thereby the user adds the advertising content to each object in the segmented frame using a "drop and drag" technique so that, for example, an icon representing the advertiser is dragged over the object using a mouse and the relevant data is automatically embedded into the object. This process continues until all objects have been embedded with interactive data. Thereby, data representative of an object is embedded 760 into the video programme signal to provide interactive content data associated with objects 765 and a number of key-frames associated with respective embedded content data as an output 770.

Thus, the identifier 700 identifies the objects to have content embedded in them by accessing a small number of key-frames from each sequence and embedding the content.

Having embedded object descriptors in key-frames and provided content it is necessary to track the objects through the successive frames of the video programme.

Referring to Figure 8, it is necessary to track an object throughout the video programme and also as an object moves within frames and is occasionally obscured by other objects or leaves the frame being viewed, altogether. Basically, the objects are defined as a series of boundary shapes plus low-level feature

functions, e.g. shapes, edges, colour, texture and intensity gradient information. Using this representation of the objects, they are tracked through the remaining frames of the video sequence in an iterative fashion. When the plural objects have been tracked and located in every frame in which they appear, then the relevant content that was embedded in the first key-frame 311 is added automatically to the remaining frames of all sequences and this is the function of the object tracker 800, shown particularly in Figure 8.

Uncut sequences and selected objects 810 are converted 815 to a low-level representation 820 used to compare objects within a frame. For all frames, a distance measure is utilised to locate each object within each frame. A convenient distance measure is the Hausdorff measure, known per se, but this measure may be augmented with other techniques. Tracking 825 of the objects through sequential frames is iteratively provided whereby the object is initially defined in the key-frame as a two-dimensional geometric shape obtained by performing edge detection and segmenting out the edges encircled within the bounding box 610. The object 610 is then located in the next frame 312 and the attributes of the object updated to reflect the changes in position and shape that have occurred between the frames. The object with these new attributes is then located in the next frame and the process of tracker 800 continues.

Once the position of each object within all the frames of a sequence of shots has been determined, post-processing of the positions to smooth over occlusions and exits and entrances of objects is carried out.

The system is impervious to lighting changes, occlusion, camera moves, shots, breaks and optical transition effects such as wipes, fades and dissolves. The system uses a variety of known techniques to enable automatic tracking in all types of vision environments, e.g. using a group of algorithms, the selection of which is dependent upon the visual complexity of the sequence. These algorithms are known per se, although the person skilled in the art may use heuristics to optimise performance for tracking. The data added to the objects in the key-frames is

then automatically added to the object in all frames as the object is tracked throughout the entire video sequence 830.

A user may review the tracks produced and enter any corrections 835. The corrections are made by stopping the reviewed sequence at the erroneous frame, clicking on the object which is in error and dragging it to its correct position. Thus, using a graphical user interface, the video is stopped at the location in which the location of the object is incorrectly identified and the bounding box 610 is dragged and dropped at its correct location, thereby re-defining the attributes of the object for that frame and basing the definition of the object for subsequent frames on that new definition, thereby producing verified tracks 845.

Finally, all frames in all sequences of the video will have relevant objects identified and embedded with interactive content data 850.

Output from the tracker 800 is applied to a streamer 900, shown in Figure 9, in which the validity of the embedded interactive content data is checked, the order that the embedded interactive content data is output is synchronised, where necessary, with the audio/visual frames.

The streamer checks that all objects in all frames have embedded content data 850 and that the content is labelled and valid using encoder setting 920 to act upon encoder and error checker 910. Verification 940 that the content is correctly labelled and valid occurs and the output 930 may be either a complete broadcasting compliant transport stream, such as MPEG-2/DVB audio, video and embedded objects and content data, or as embedded objects and content data alone.

The streamer 900 must determine in which of three categories the embedded content data falls, namely frame-synchronous data, segment-synchronous data, or data to be streamed just-in-time. Frame synchronous data consists of the object positions, shapes, ranks and pointers to a table of pointers to data may be associated with the correct frame number in the video programme from source 201. Segment-synchronous data is used to update the table of pointers to embedded content data so that when objects

change, the embedded data changes. This data may be associated with the frame number at which the content changes. Data to be streamed "just in time" must be streamed to the end user before it is required by any of the objects. This transport stream is then packetised into MPEG-2/DVB compliant packets.

If a fully embedded audio visual programme is required, the packetised transport stream and the video programme are multiplexed together, as shown in Figure 10.

Referring to Figure 10, the different elements that constitute the embedded video programme are combined into a single transport stream 1001 in preparation for broadcasting by a network operator. The programme consists of a video stream 1010, an audio stream 1020, both of which streams are uncompressed. Both the video data 1010 and the audio data 1020 are encoded and compressed in respective MPEG-2 elementary encoders 1015 and 1025 to produce elementary streams of data 1030, 1035 respectively. MPEG-2 compliant data sequence 930 is error checked 1037 to produce an elementary stream of data 1040. The elementary streams 1030, 1035 and 1040 are applied to packetisers 1050, 1055 and 1060, which each accumulate data into fixed size blocks to which is added a protocol header. The output from the packetisers is termed a packetised elementary stream (PES) 1070. The packetised elementary streams 1070, in combination with digital control data (PSI) 1075, is applied to a systems layer multiplexer 1080 having a systems clock 1085. The PES packet is a mechanism to convert continuous elementary streams of information 1030, 1035 and data sequence 930 into a stream of packets. Once embedded in PES packets the elementary streams may be synchronised with time stamps. This is necessary to enable the receiver (PC or TV) to determine the relationship between all the video, audio and data streams that constitute the embedded video programme.

Each PES packet is fed to the system multiplexer 1080. There the packets are encapsulated into transport packets to form the transport stream 1001 that is used for broadcast. In this respect, the transport stream 1001 carries packets in 188 byte blocks and the transport stream 1001 constitutes a full so-called

eMUSE channel that is fed to the network operator for broadcast. In essence, the transport stream is a general purpose way of combining multiple streams using fixed length packets.

The structure of a packet is shown in Figure 11. The packet 1100 shown in Figure 11 has a header 1110 with a synchronisation byte, a 13-bit packet identifier (PID) and a set of flags to indicate how the packet should be processed. The transport multiplexer assigns a different packet identifier to each PES 1070 to uniquely identify the individual streams. In this way, the packetised data sequence 930 is uniquely identified. The synchronisation of the elementary streams is facilitated by sending time stamps in the transport stream 1001.

Two types of time stamps may be used:

1. A reference time stamp to indicate the current time, that is clock 1085 information, and
2. A decoding time stamp.

The decoding time stamps are inserted into the PES to indicate the exact time when the data stream has to be synchronised with the video and audio streams. The decoding time stamp relies on the reference time stamp for operation. After the transport stream has been broadcast, the PC or TV uses the time stamps to process the data sequence in relation to the video and audio streams.

In order for the receiver (PC or TV) to know how to decode the channel, it needs to access a set of signalling tables known as Programme Specific Information (PSI) labels which are sent as separate packets within the transport stream 1001 with their own PID tables. There are two tables that are needed to enable the receiver to decode a channel. The first is the programme association table (PAT) 1130 which lists all the channels that are available within the satellite broadcast and has a packet ID (PID) value of 0 which makes it easy to identify. In the example, the eMUSE channel, i.e. the channel carrying the video programme, is represented as PID 111.

A programme table map (PMT) 1140 identifies all the elementary streams contained in the embedded video signal. Each elementary stream is identified by a PID value, e.g. video from

video camera 1 is PID 71. The data sequence 930 has a PID value 92 in the example of Figure 11. The receiver video and audio decoders search the PMT table to find the appropriate packets to decode. Similarly, the programme for retrieving the embedded data searches the PMT to find the data sequence which, in the example of Figure 11, is PID 92. The data retrieval programme then filters out these packets and synchronises them with the appropriate video and audio to enable the user to select the various objects.

Having embedded the interactive content data into the video programme signal, it is broadcast and the manner of reception and retrieval of the data will now be explained with reference to Figure 12.

Hardware is provided on a satellite receiver card 1210 which resides on the user's PC 40 or digital set top box 50 and software allows the viewer to interact with the dynamic objects in the broadcast, for example to facilitate Internet access and Internet browsers, such as Internet Explorer and Netscape and, for TV applications, is compatible with Sun's Open TV operating system.

The received MPEG-2/DVB signal is separated into MPEG-2 video 1215, MPEG-2 audio 1220 and the data sequence 930 and the decoded video 1225, audio and data sequence is applied to a synchroniser 1230. Output from the synchroniser comprising the video programme with embedded interactive content data is displayed 1240 by the PC VDU or TV screen.

A user clicks a mouse 56 or presses a remote control button at a frame containing an object of interest, which causes the display on the screen to split in two. For example, on the left hand screen, the video programme continues to run as normal and, on the right hand screen, the objects present in the frame which was active the time the mouse was clicked, are displayed as cut-outs, with the intervening spaces blanked out. The user then clicks on the object of interest to see which advertisers it represents, e.g. if the user clicks on the lead singer, then the screen will display the lead singer only and a textual list of advertisers or an icon-based display of advertisers will be

viewed. If the user clicks on the advertiser's name or icon, the user goes directly to view the advertised products.

After interacting with the site the user may decide to purchase the product via an e-commerce transaction. Further, if the user clicks on the suit of the lead singer, the entire catalogue of the suit manufacturer may be made available as part of the streamed digital broadcast. This return path via the Internet is purely to facilitate a transaction as the data sequence 930 initiates the push technology approach to streaming advertising information once the user has selected amongst the numerous objects within the frame.

Although the user can interact with the broadcast in such an on-line manner as described above, alternatively, the data may be viewed off-line, i.e. while a viewer continues to watch a programme, the user may select various frames during the broadcast and store the frames for later retrieval of the associated data. Where there is not sufficient local memory to store the data, addresses of the data in local or remote databases, e.g. Web sites, are stored and the end user is able to subsequently access the databases to retrieve the data. The user then selects with the mouse or the remote control the object 600 of interest and another screen may then be displayed showing the object 600 and a menu of data elements associated with that object. The user clicks one of the menu items and is able to directly view data on the advertised product or be given access to a Web site over the Internet. Alternatively, as soon as a user selects a menu item, a catalogue may be viewed which has been embedded in the broadcast signal.

The data which the end user accesses may be streamed with a broadcast signal or may be held in a local data base which may be pre-loaded into the end user's device prior to viewing the video sequence. When viewing information streamed with a broadcast, the information associated with a particular programme is streamed in parallel with the programme and stored locally. When the user selects an object, this local data is viewed.

Claims:

1. An apparatus for associating data representative of an object with a digital video programme including means for providing a digital video programme having plural individual frames at least some of which incorporate said object, means for parsing the video programme by identifying separate shots in the video programme to produce an edit list, means for identifying shots containing related content to form a sequence of shots containing related content, means for selecting at least one key-frame from within each sequence of shots, means for selecting said object within the key-frame with which data is to be associated, means for extracting attributes of the object from the key-frame, means for associating interactive data with the object in the key-frame, tracking means for utilising the attributes of the object for tracking the object through the sequence of shots, whereby said interactive data is associated with the object in the sequence of shots and said interactive content data is embedded with data representative of said object in a data sequence.

2. An apparatus as claimed in claim 1, wherein the means for identifying shots containing related content to form a sequence of shots containing related content includes means for producing a hierarchy of groups of shots.

3. An apparatus as claimed in claims 1 or 2, wherein said means for parsing include means for inputting criteria to be used to recognise a change of shot.

4. An apparatus as claimed in any of claims 1 to 3, wherein the means for extracting attributes of the object includes means for isolating the object within a boundary formed on the frame, means for performing edge detection within the boundary to identify and locate edges of said

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object, and storing means for storing a geometric model of said object.

5. An apparatus as claimed in any of claims 1 to 4, wherein said means for extracting attributes of said object also includes means for recording at least one of the attributes of shape, size, position, colour, texture, intensity gradient of said object, and time series statistics based on said attributes.

6. An apparatus as claimed in any of the preceding claims, wherein said means for extracting attributes of said object includes means for comparing said attributes of said object with attributes of objects previously stored to determine whether the object is distinguishable therefrom, and when said object is determined not to be distinguishable, providing means for re-defining the object.

7. An apparatus as claimed in any of the preceding claims, wherein said means for extracting attributes of said object includes means for comparing the location in the frame of said object with the location of objects already stored for that frame to determine whether that object is distinguishable therefrom, and where the location of said object is not distinguishable from the location of another object providing means for assigning rank to the objects to determine which object will be associated with that location.

8. An apparatus, as claimed in any of the preceding claims, wherein the means for utilising the attributes of the object for tracking the object includes means for updating the stored attributes of the object as the attributes of the object change from frame to frame.

9. An apparatus as claimed in any of the preceding claims, wherein said tracking means utilising the attributes of the object for tracking the object includes

plural algorithm means for calculation of independent tracks of objects for use depending on the visual complexity of a sequence to automatically track said objects in different types of visual environment.

10. An apparatus as claimed in any of the preceding claims, wherein said tracking means for utilising the attributes of the object for tracking the object includes means for converting all the frames to be tracked to a low-level representation, means for determining the position of each object in the frames by minimising a distance measure to locate each object in each frame, means for processing the positions of said object to smooth over occlusions and the entrances and exits of objects into and out of said frames, and means for reviewing the object within a tracked sequence and for correcting the location attributes of any misplaced objects.

11. An apparatus, as claimed in any of the preceding claims, wherein the means for associating interactive data with the object in the key-frame includes means for providing a database of different types of data including one or more of URLs, HTML pages, video clips, audio clips, text files and multimedia catalogues, and means for selecting said interactive content data from the database to associate with said object.

12. An apparatus, as claimed in any of the preceding claims, wherein the means for associating interactive data with the object in the key-frame produces said data sequence using means for determining whether the embedded interactive content data is frame synchronous data associated with object positions, shapes, ranks and pointers in a frame, or group-synchronous data associated with all the objects in a group, or is data to be streamed just in time, wherein means are provided for associating frame synchronous data with the corresponding frame, means are provided for associating group

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synchronous data with the frame at which a group changes, and means are provided for streaming just in time data to a user before it is required to be associated with the corresponding objects.

13. An apparatus as claimed in any of the preceding claims, wherein means are provided to associate different interactive content data with respectively different objects.

14. A method for associating interactive data representative of an object with a digital video programme including the steps of:
a) providing a digital video programme having a plurality of individual frames at least some of which incorporate said object with which data is to be associated,
b) parsing the video programme by identifying separate shots in the video programme to produce an edit list,
c) identifying, from the edit list, shots containing related content to form a sequence of shots containing related content,
d) selecting at least one key-frame containing the object from within the sequence of shots,
e) locating said object within the at least one key-frame,
f) extracting attributes of the object from the at least one key-frame,
g) associating interactive data with the object in the at least one key-frame,
h) tracking the object through the sequence of shots utilising the attributes of the object,
i) associating said interactive data with the object in frames in the sequence of shots, and
j) embedding said interactive data with data representative of said object in a data sequence representative of the digital video programme.

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15. A method as claimed in claim 14, wherein step b) includes the step of inputting criteria to be used to recognise a change of shot.

16. A method as claimed in claims 14 or 15, wherein step c) includes the step of producing a hierarchy of groups of sequences of shots.

17. A method as claimed in any of claims 14 to 16, wherein step e) includes the steps of: isolating the object within a boundary formed on the frame, performing edge detection within the boundary to identify and locate edges of said object, and step f) includes storing a geometric model of said object.

18. A method as claimed in any of claims 14 to 17, wherein step f) includes the step of recording at least one of the attributes of shape, size, position, colour, texture, intensity gradient of said object, and time series statistics based on said attributes.

19. A method as claimed in any of claims 14 to 18, wherein step f) includes the step of comparing said attributes of said object with attributes of objects previously stored to determine whether the object is distinguishable therefrom, and when said object is determined not to be distinguishable, the step of re-defining the object.

20. A method as claimed in any of claims 14 to 19, wherein step f) includes the step of comparing the location in the frame of said object with the location of objects already stored for that frame to determine whether that object is distinguishable therefrom, and where the location of said object is not distinguishable from the location of another object, the step of assigning rank to the objects to determine which object will be associated with that location.

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21. A method, as claimed in any of claims 14 to 20, wherein step h) includes the step of updating the stored attributes of the object as the attributes of the object change from frame to frame.

22. A method as claimed in any of claims 14 to 21, wherein step h) includes the step of using plural algorithm means for calculation of independent tracks of objects for use depending on the visual complexity of a sequence automatically to track said objects in different types of visual environment.

23. A method as claimed in any of claims 14 to 22, wherein step h) includes the steps of converting all the frames to be tracked to a low-level representation, determining the position of each object in the frames by minimising a distance measure to locate each object in each frame, processing the positions of said object to smooth over occlusions and the entrances and exits of objects into and out of said frames, reviewing the object within a tracked sequence and correcting the location attributes of any misplaced objects.

24. A method, as claimed in any of claims 14 to 23, wherein step g) includes the steps of providing a database of different types of data including one or more of URLs, HTML pages, video clips, audio clips, text files and multimedia catalogues, and selecting said interactive content data from the database to associate with said object.

25. A method, as claimed in any of claims 14 to 24, wherein step j) includes determining whether the embedded interactive content data is frame synchronous data associated with object positions, shapes, ranks and pointers in a frame, or group-synchronous data associated with all the objects in a group, or is data to be streamed just in time, and associating frame synchronous data with the corresponding frame, associating group

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synchronous data with the frame at which a group changes, and streaming just in time data to a user before it is required to be associated with the corresponding objects, respectively.

26. A method as claimed in any of claims 14 to 25, wherein in steps d) to j) different interactive content data are associated with respectively different objects.

27. A computer program comprising code means for performing all the steps of the method of any of claims 14 to 26 when the program is run on one or more computers.

28. A computer program as claimed in claim 27, wherein the computer program is embodied on a computer-readable medium.

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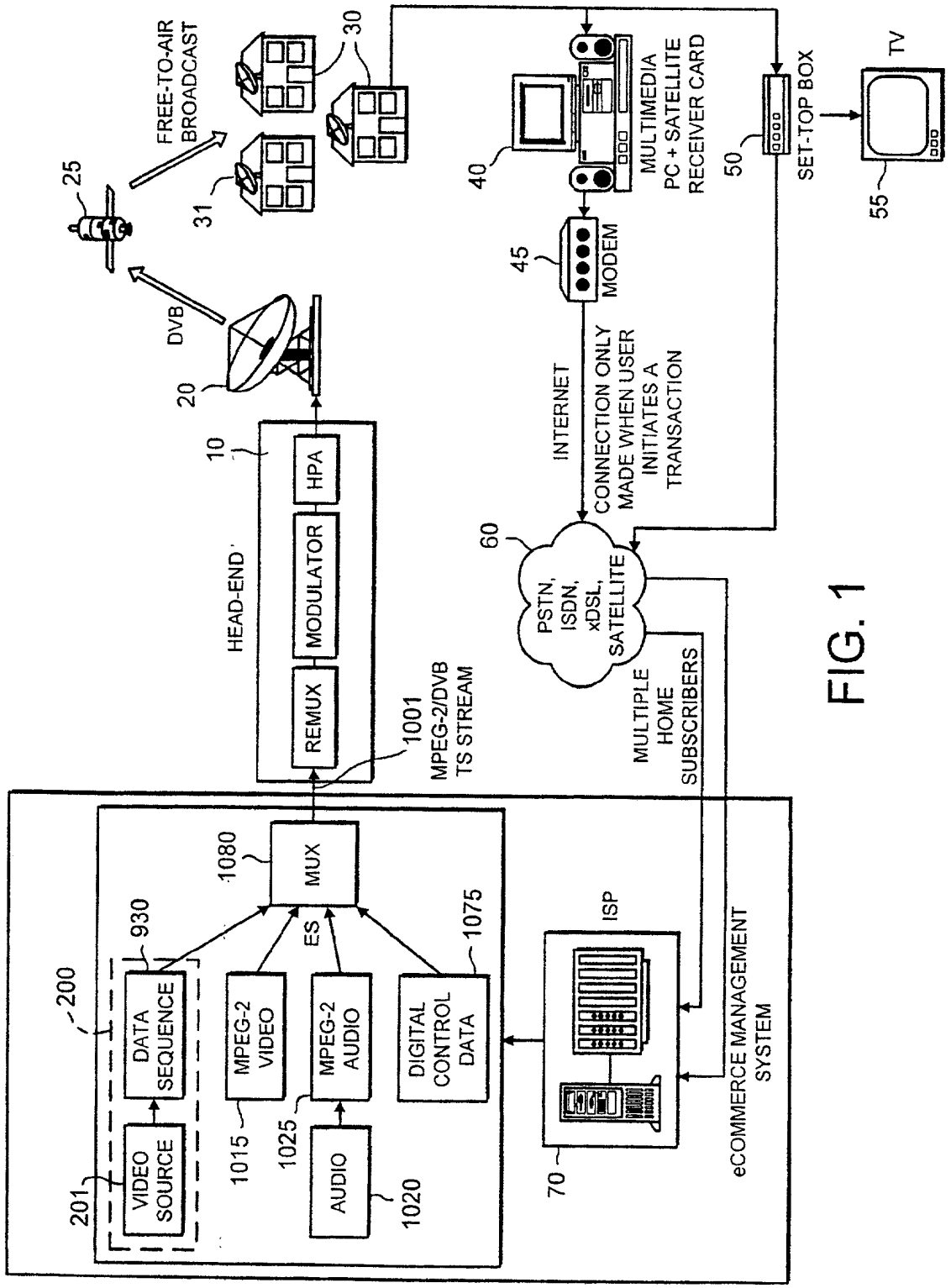
FREE-TO-AIR BROADCAST
DVB
HEAD-END
REMUX
MODULATOR
HPA
MPEG-2/DVB TS STREAM
INTERNET
CONNECTION ONLY MADE WHEN USER INITIATES A TRANSACTION
MODEM
MULTIMEDIA PC + SATELLITE RECEIVER CARD
SET-TOP BOX
TV
PSTN, ISDN, xDSL, SATELLITE
MULTIPLE HOME SUBSCRIBERS
ISP
eCOMMERCE MANAGEMENT SYSTEM
MUX
ES
DATA SEQUENCE
MPEG-2 VIDEO
MPEG-2 AUDIO
DIGITAL CONTROL DATA
VIDEO SOURCE
AUDIO
200
201
930
1080
1075
1015
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1020
1001
10
20
25
30
31
40
45
50
55
60
70

FIG. 1

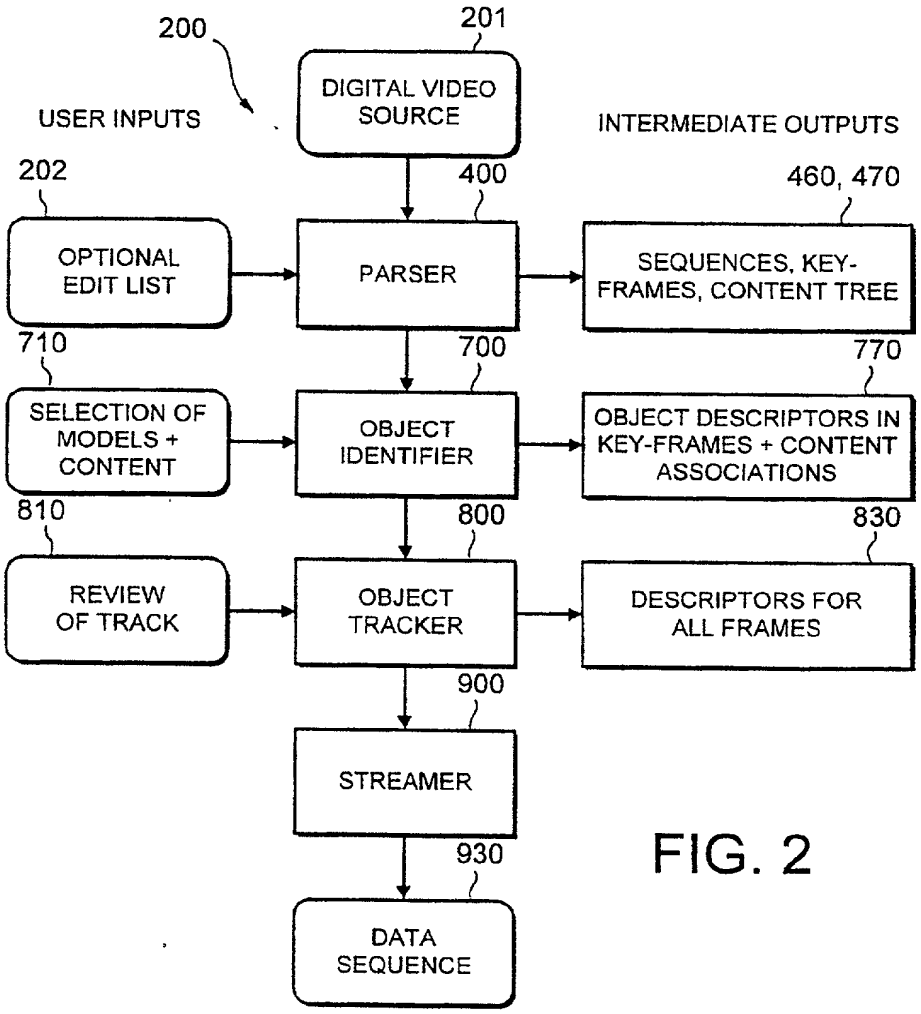
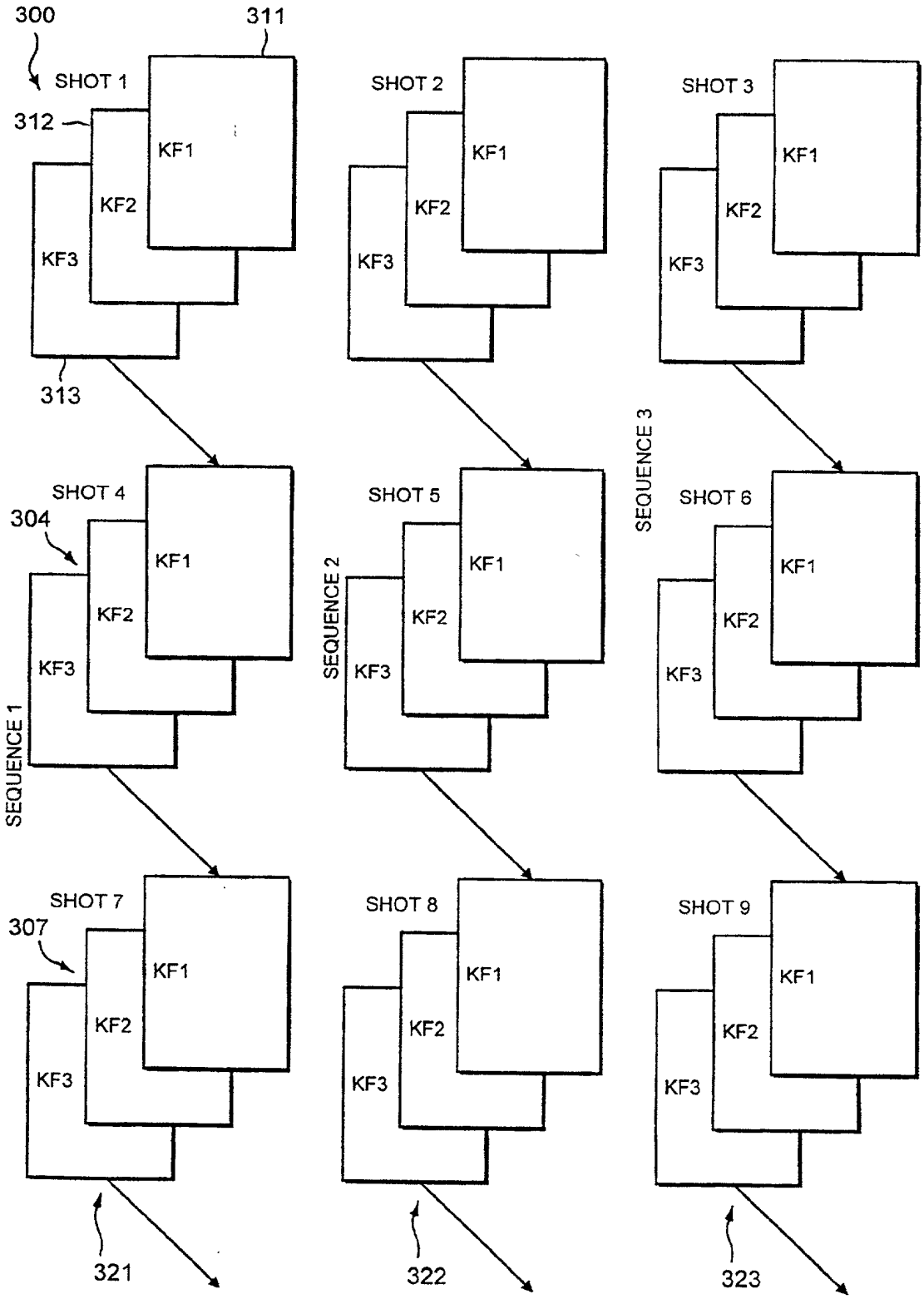

200
201
DIGITAL VIDEO SOURCE
USER INPUTS
INTERMEDIATE OUTPUTS
202
400
460, 470
OPTIONAL EDIT LIST
PARSER
SEQUENCES, KEY-FRAMES, CONTENT TREE
710
700
770
SELECTION OF MODELS + CONTENT
OBJECT IDENTIFIER
OBJECT DESCRIPTORS IN KEY-FRAMES + CONTENT ASSOCIATIONS
810
800
830
REVIEW OF TRACK
OBJECT TRACKER
DESCRIPTORS FOR ALL FRAMES
900
STREAMER
930
DATA SEQUENCE

FIG. 2


300
311
SHOT 1
312
KF1
KF2
KF3
313
SHOT 2
KF1
KF2
KF3
SHOT 3
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KF2
KF3
SEQUENCE 3
SHOT 4
304
KF1
KF2
KF3
SEQUENCE 1
SHOT 5
KF1
KF2
KF3
SEQUENCE 2
SHOT 6
KF1
KF2
KF3
SHOT 7
307
KF1
KF2
KF3
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SHOT 8
KF1
KF2
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322
SHOT 9
KF1
KF2
KF3
323

FIG. 3

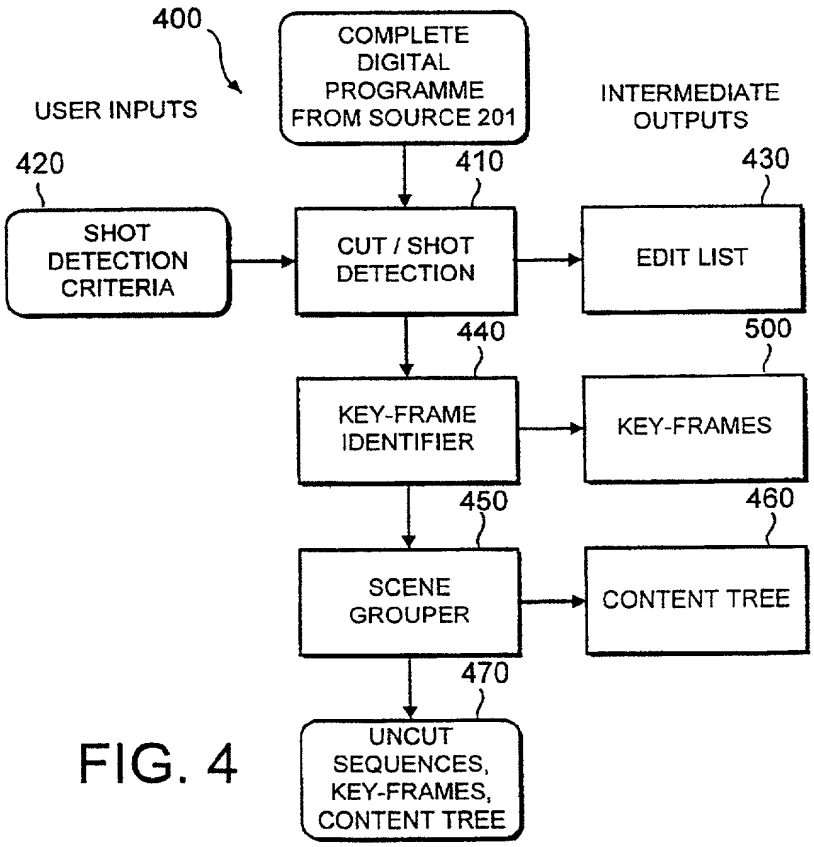
400
COMPLETE DIGITAL PROGRAMME FROM SOURCE 201
USER INPUTS
INTERMEDIATE OUTPUTS
420
410
430
SHOT DETECTION CRITERIA
CUT / SHOT DETECTION
EDIT LIST
440
500
KEY-FRAME IDENTIFIER
KEY-FRAMES
450
460
SCENE GROUPER
CONTENT TREE
470
UNCUT SEQUENCES, KEY-FRAMES, CONTENT TREE

FIG. 4

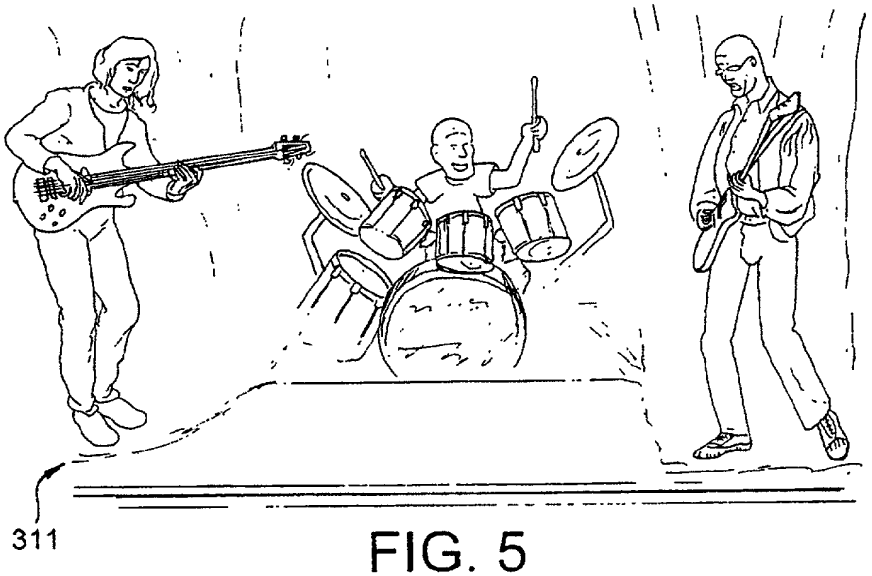

FIG. 5

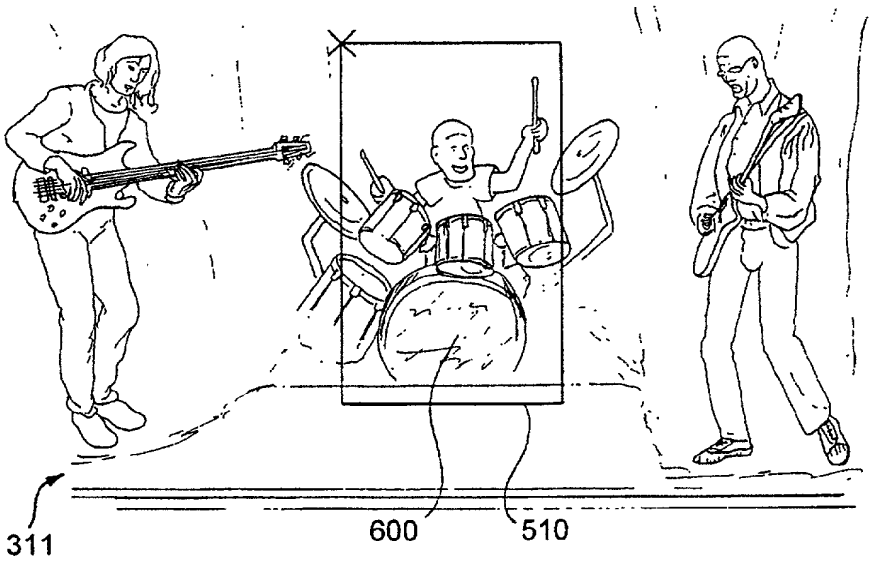

FIG. 6

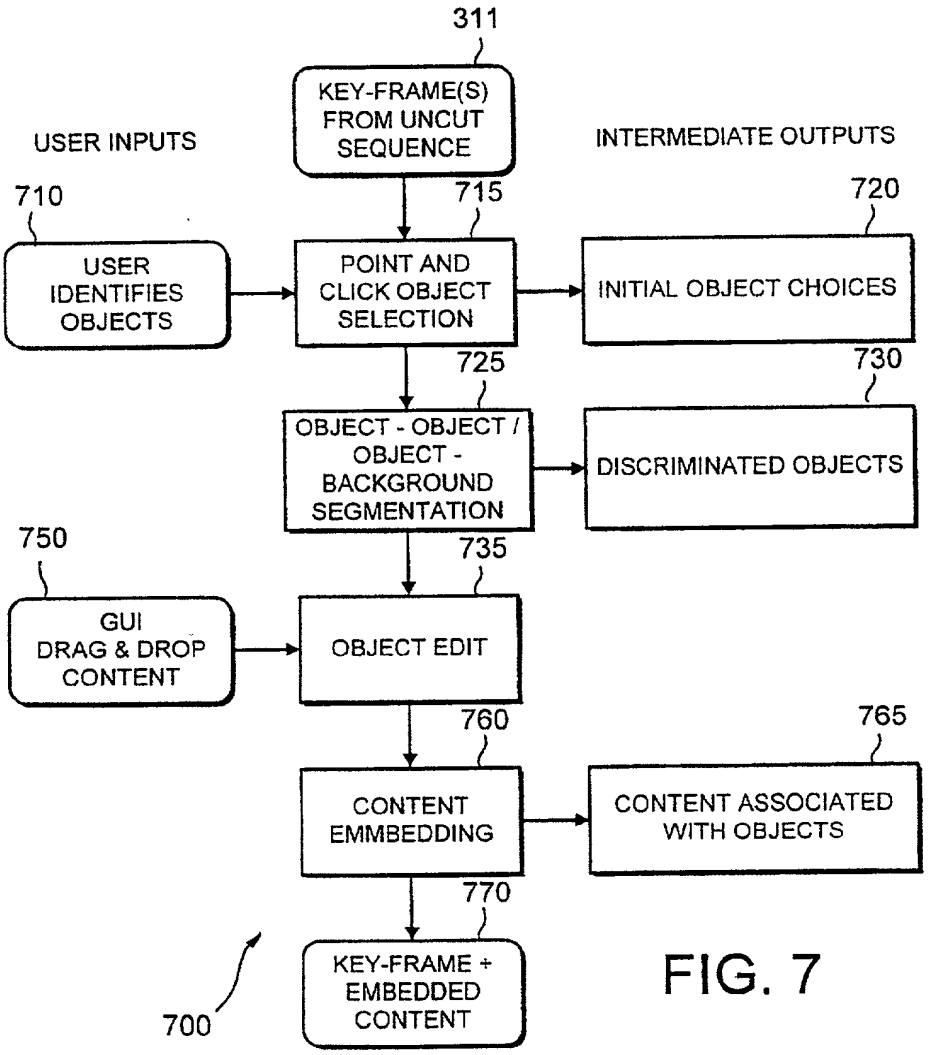
311
KEY-FRAME(S) FROM UNCUT SEQUENCE
USER INPUTS
INTERMEDIATE OUTPUTS
710
715
720
USER IDENTIFIES OBJECTS
POINT AND CLICK OBJECT SELECTION
INITIAL OBJECT CHOICES
725
730
OBJECT - OBJECT / OBJECT - BACKGROUND SEGMENTATION
DISCRIMINATED OBJECTS
750
735
GUI DRAG & DROP CONTENT
OBJECT EDIT
760
765
CONTENT EMMBEDDING
CONTENT ASSOCIATED WITH OBJECTS
770
KEY-FRAME + EMBEDDED CONTENT
700

FIG. 7

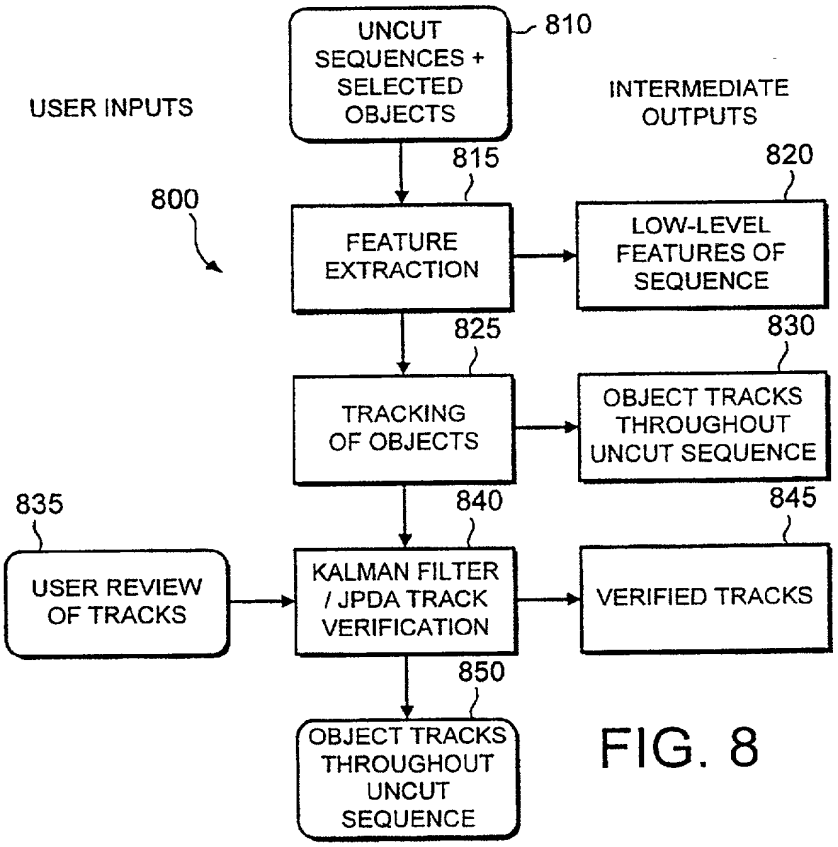
UNCUT SEQUENCES + SELECTED OBJECTS
810
USER INPUTS
INTERMEDIATE OUTPUTS
815
820
800
FEATURE EXTRACTION
LOW-LEVEL FEATURES OF SEQUENCE
825
830
TRACKING OF OBJECTS
OBJECT TRACKS THROUGHOUT UNCUT SEQUENCE
835
840
845
USER REVIEW OF TRACKS
KALMAN FILTER / JPDA TRACK VERIFICATION
VERIFIED TRACKS
850
OBJECT TRACKS THROUGHOUT UNCUT SEQUENCE

FIG. 8

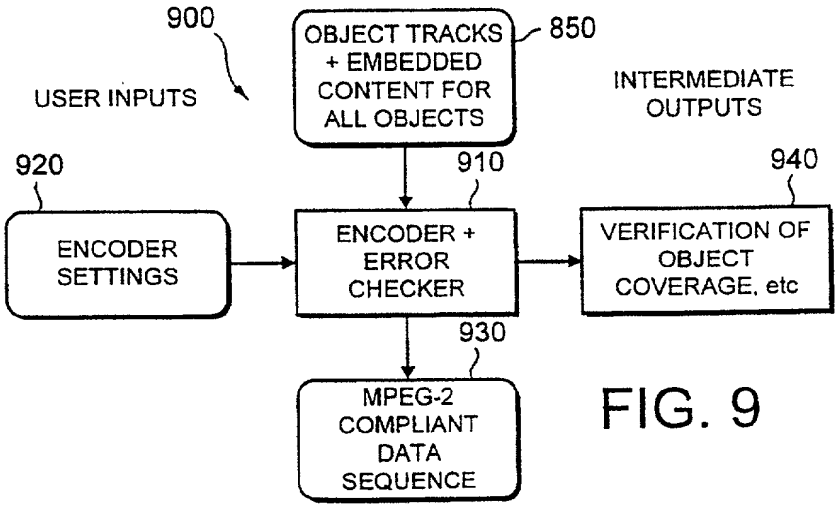
900
OBJECT TRACKS + EMBEDDED CONTENT FOR ALL OBJECTS
850
USER INPUTS
INTERMEDIATE OUTPUTS
920
910
940
ENCODER SETTINGS
ENCODER + ERROR CHECKER
VERIFICATION OF OBJECT COVERAGE, etc
930
MPEG-2 COMPLIANT DATA SEQUENCE

FIG. 9

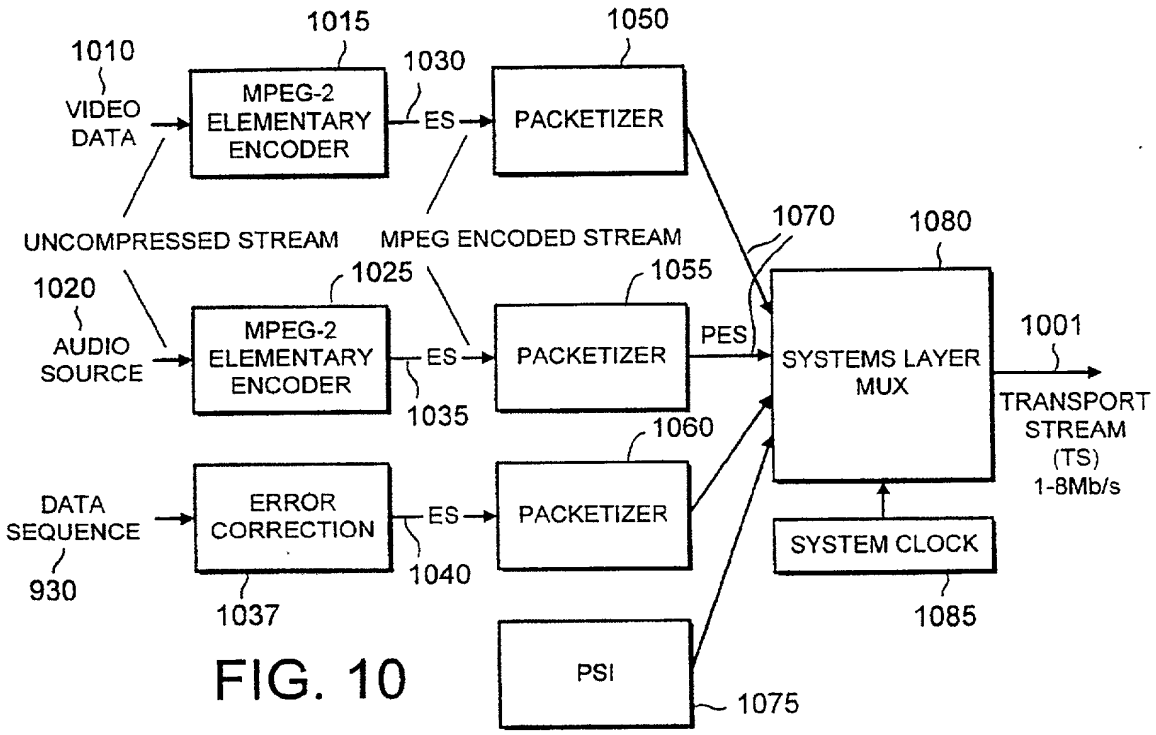
1010
VIDEO DATA
1015
MPEG-2 ELEMENTARY ENCODER
1030
ES
1050
PACKETIZER
UNCOMPRESSED STREAM
MPEG ENCODED STREAM
1070
1080
1020
AUDIO SOURCE
1025
MPEG-2 ELEMENTARY ENCODER
ES
1035
1055
PACKETIZER
PES
SYSTEMS LAYER MUX
1001
TRANSPORT STREAM (TS) 1-8Mb/s
1060
DATA SEQUENCE
930
ERROR CORRECTION
ES
1040
1037
PACKETIZER
SYSTEM CLOCK
1085
PSI
1075

FIG. 10

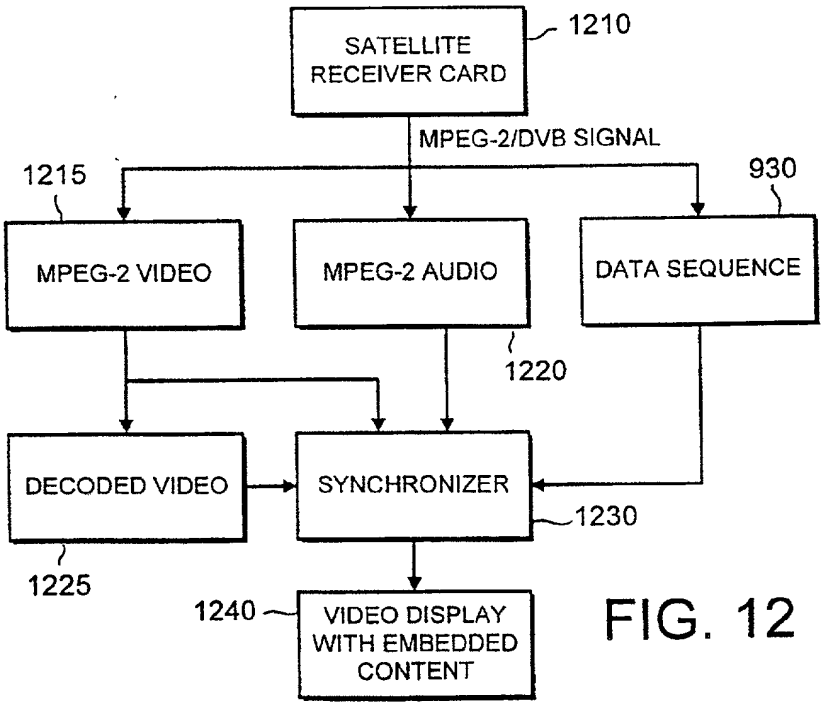
SATELLITE RECEIVER CARD
1210
MPEG-2/DVB SIGNAL
1215
930
MPEG-2 VIDEO
MPEG-2 AUDIO
DATA SEQUENCE
1220
DECODED VIDEO
SYNCHRONIZER
1230
1225
1240
VIDEO DISPLAY WITH EMBEDDED CONTENT

FIG. 12

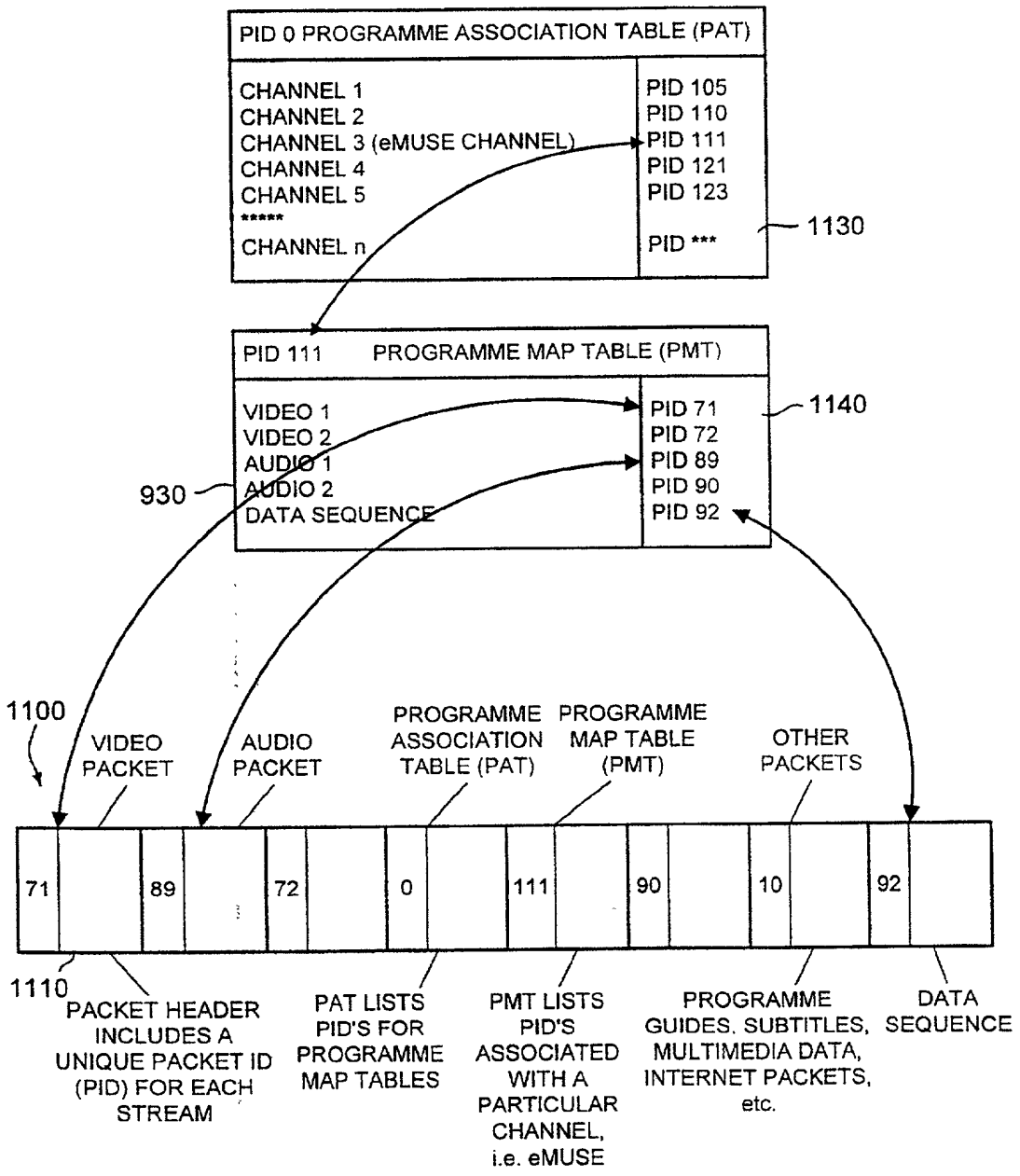
PID 0 PROGRAMME ASSOCIATION TABLE (PAT)
CHANNEL 1
CHANNEL 2
CHANNEL 3 (eMUSE CHANNEL)
CHANNEL 4
CHANNEL 5
*****
CHANNEL n
PID 105
PID 110
PID 111
PID 121
PID 123
PID ***
1130
PID 111 PROGRAMME MAP TABLE (PMT)
VIDEO 1
VIDEO 2
AUDIO 1
AUDIO 2
DATA SEQUENCE
930
PID 71
PID 72
PID 89
PID 90
PID 92
1140
1100
VIDEO PACKET
AUDIO PACKET
PROGRAMME ASSOCIATION TABLE (PAT)
PROGRAMME MAP TABLE (PMT)
OTHER PACKETS
71
89
72
0
111
90
10
92
1110
PACKET HEADER INCLUDES A UNIQUE PACKET ID (PID) FOR EACH STREAM
PAT LISTS PID'S FOR PROGRAMME MAP TABLES
PMT LISTS PID'S ASSOCIATED WITH A PARTICULAR CHANNEL, i.e. eMUSE
PROGRAMME GUIDES, SUBTITLES, MULTIMEDIA DATA, INTERNET PACKETS, etc.
DATA SEQUENCE

FIG. 11

Practitioner's Docket No. U 013563-5 ***PATENT***

Optional Customer No. Bar Code

00140

PATENT TRADEMARK OFFICE

COMBINED DECLARATION AND POWER OF ATTORNEY

(ORIGINAL, DESIGN, NATIONAL STAGE OF PCT, SUPPLEMENTAL, DIVISIONAL, CONTINUATION, OR C-I-P)

As a below named inventor, I hereby declare that:

TYPE OF DECLARATION

This declaration is of the following type:

(check one applicable item below)

[ ] original.
[ ] design.

NOTE: With the exception of a supplemental oath or declaration submitted in a reissue, a supplemental oath or declaration is not treated as an amendment under 37 CFR 1.312 (Amendments after allowance). M.P.E.P. Section 714.16, 7th Ed.

[ ] supplemental.

NOTE: If the declaration is for an International Application being filed as a divisional, continuation or continuation-in-part application, do not check next item; check appropriate one of last three items.

[x] national stage of PCT.

NOTE: If one of the following 3 items apply, then complete and also attach ADDED PAGES FOR DIVISIONAL, CONTINUATION OR C-I-P.

NOTE: See 37 C.F.R. Section 1 63(d) (continued prosecution application) for use of a prior nonprovisional application declaration in the continuation or divisional application being filed on behalf of the same or fewer of the inventors named in the prior application.

[ ] divisional.
[ ] continuation.

NOTE: Where an application discloses and claims subject matter not disclosed in the prior application, or a continuation or divisional application names an inventor not named in the prior application, a continuation-in-part application must be filed under 37 C.F.R. Section 1.53(b) (application filing requirements-nonprovisional application).

[ ] continuation-in-part (C-I-P).

INVENTORSHIP IDENTIFICATION

WARNING: *If the inventors are each not the inventors of all the claims, an explanation of the facts, including the ownership of all the claims at the time the last claimed invention was made, should be submitted.*

My residence, post office address and citizenship are as stated below, next to my name. I believe that I am the original, first and sole inventor *(if only one name is listed below)* or an original, first and joint inventor *(if plural names are listed below)* of the subject matter that is claimed, and for which a patent is sought on the invention entitled:

TITLE OF INVENTION

INTERACTIVE SYSTEM

SPECIFICATION IDENTIFICATION

The specification of which:

(complete (a), (b), or (c))

(a) [ ] is attached hereto.

NOTE: "The following combinations of information supplied in an oath or declaration filed on the application filing date with a specification are acceptable as minimums for identifying a specification and compliance with any one of the items below will be accepted as complying with the identification requirement of 37 C.F.R. Section 1.63:

"(1) name of inventor(s), and reference to an attached specification which is both attached to the oath or declaration at the time of execution and submitted with the oath or declaration on filing;

"(2) name of inventor(s), and attorney docket number which was on the specification as filed; or

"(3) name of inventor(s), and title which was on the specification as filed."

Notice of July 13, 1995 (1177 O.G. 60).

(b) [ ] was filed on _____, [ ] as Application No. _____
[ ] and was amended on _____ (if applicable).

NOTE: Amendments filed after the original papers are deposited with the PTO that contain new matter are not accorded a filing date by being referred to in the declaration. Accordingly, the amendments involved are those filed with the application papers or, in the case of a supplemental declaration, are those amendments claiming matter not encompassed in the original statement of invention or claims. See 37 C.F.R. Section 1.67.

NOTE: "The following combinations of information supplied in an oath or declaration filed after the filing date are acceptable as minimums for identifying a specification and compliance with any one of the items below will be accepted as complying with the identification requirement of 37 C.F.R. Section 1.63:

(A) application number (consisting of the series code and the serial number, e.g., 08/123,456);
(B) serial number and filing date;
(C) attorney docket number which was on the specification as filed;
(D) title which was on the specification as filed and reference to an attached specification which is both attached to the oath or declaration at the time of execution and submitted with the oath or declaration; or
(E) title which was on the specification as filed and accompanied by a cover letter accurately identifying the application for which it was intended by either the application number (consisting of the series code and the serial number, e.g., 08/123,456), or serial number and filing date. Absent any statement(s) to the contrary, it will be presumed that the application filed in the PTO is the application which the inventor(s) executed by signing the oath or declaration.

M.P.E.P. Section 601.01(a), 7th ed.

(c) [x] was described and claimed in PCT International Application No. PCT/IB00/00135 filed on January 28, 2000 and as amended under PCT Article 19 on _____ *(if any)*.

SUPPLEMENTAL DECLARATION (37 C.F.R. Section 1.67(b))

(complete the following where a supplemental declaration is being submitted)

[ ] I hereby declare that the subject matter of the

[ ] attached amendment
[ ] amendment filed on _____.

was part of my/our invention and was invented before the filing date of the original application, above identified, for such invention.

ACKNOWLEDGMENT OF REVIEW OF PAPERS AND DUTY OF CANDOR

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information, which is material to patentability as defined in 37, Code of Federal Regulations, Section 1.56,

(also check the following items, if desired)

[ ] and which is material to the examination of this application, namely, information where there is a substantial likelihood that a reasonable Examiner would consider it important in deciding whether to allow the application to issue as a patent, and

[ ] in compliance with this duty, there is attached an information disclosure statement, in accordance with 37 C.F.R. Section 1.98.

PRIORITY CLAIM (35 U.S.C. Section 119(a)-(d))

NOTE: "The claim to priority need be in no special form and may be made by the attorney or agent if the foreign application is referred to in the oath or declaration as required by Section 1.63. The claim for priority and the certified copy of the foreign application specified in 35 U.S.C. Section 119(b) must be filed in the case of an interference (Section 1.630), when necessary to overcome the date of a reference relied upon by the examiner, when specifically required by the examiner, and in all other situations, before the patent is granted. If the claim for priority or the certified copy of the foreign application is filed after the date the issue fee is paid, it must be accompanied by a petition requesting entry and by the fee set forth in Section 1.17(i). If the certified copy is not in the English language, a translation need not be filed except in the case of interference; or when necessary to overcome the date of a reference relied upon by the examiner; or when specifically required by the examiner, in which event an English language translation must be filed together with a statement that the translation of the certified copy is accurate." 37 C.F.R. Section 1.55(a).

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d) of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed.

(complete (d) or (e))

(d) [ ] no such applications have been filed.
(e) [x] such applications have been filed as follows.

NOTE: Where item (c) is entered above and the International Application which designated the U.S. itself claimed priority check item (e), enter the details below and make the priority claim.

PRIOR FOREIGN/PCT APPLICATION(S) FILED WITHIN 12 MONTHS (6 MONTHS FOR DESIGN) PRIOR TO THIS APPLICATION AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. SECTION 119(a)-(d)

COUNTRY (OR INDICATE IF PCT)	APPLICATION NUMBER	DATE OF FILING DAY, **MONTH**, YEAR	PRIORITY CLAIMED UNDER 35 USC 119
GB	9902235.0	1 February 1999	[x]YES [ ]NO
			[ ]YES [ ]NO
			[ ]YES [ ]NO
			[ ]YES [ ]NO
			[ ]YES [ ]NO

CLAIM FOR BENEFIT OF PRIOR U.S. PROVISIONAL APPLICATION(S)
(35 U.S.C. Section 119(e))

I hereby claim the benefit under Title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below:

PROVISIONAL APPLICATION NUMBER	**FILING DATE**
_____/_____	_____
_____/_____	_____
_____/_____	_____

CLAIM FOR BENEFIT OF EARLIER U.S./PCT APPLICATION(S) UNDER 35 U.S.C. SECTION 120

[ ] The claim for the benefit of any such applications are set forth in the attached ADDED PAGES TO COMBINED DECLARATION AND POWER OF ATTORNEY FOR DIVISIONAL, CONTINUATION OR CONTINUATION-IN-PART (C-I-P) APPLICATION.

ALL FOREIGN APPLICATION(S), *IF ANY,* FILED MORE THAN 12 MONTHS (6 MONTHS FOR DESIGN) PRIOR TO THIS U.S. APPLICATION

_____

_____

_____

NOTE: If the application filed more than 12 months from the filing date of this application is a PCT filing forming the basis for this application entering the United States as (1) the national stage, or (2) a continuation, divisional, or continuation-in-part, then also complete ADDED PAGES TO COMBINED DECLARATION AND POWER OF ATTORNEY FOR DIVISIONAL, CONTINUATION OR C-I-P APPLICATION for benefit of the prior U.S. or PCT application(s) under 35 U.S.C. Section 120.

POWER OF ATTORNEY

I hereby appoint the following practitioner(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

(list name and registration number)

JOSEPH H. HANDELMAN, 26179

JOHN RICHARDS, 31053

RICHARD J. STREIT, 25765

PETER D. GALLOWAY, 27885

IAIN C. BAILLIE, 24090

RICHARD P. BERG, 28145

JULIAN H. COHEN, 20302

WILLIAM R. EVANS 25858

JANET I. CORD, 33778

CLIFFORD J. MASS, 30086

CYNTHIA R. MILLER, 34678

(Check the following item, if applicable)

[ ] I hereby appoint the practitioner(s) associated with the Customer Number provided below to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

[ ] Attached, as part of this declaration and power of attorney, is the authorization of the above-named practitioner(s) to accept and follow instructions from my representative(s).

NOTE: "Special care should be taken in continuation or divisional applications to ensure that any change of correspondence address in a prior application is reflected in the continuation or divisional application. For example, where a copy of the oath or declaration from the prior application is submitted for a continuation or divisional application filed under 37 CFR 1.53(b) and the copy of the oath or declaration from the prior application designates an old correspondence address, the Office may not recognize, in the continuation or divisional application, the change of correspondence address made during the prosecution of the prior application. Applicant is required to identify the change of correspondence address in the continuation or divisional application to ensure that communications from the Office are mailed to the current correspondence address. 37 CFR 1.63(d)(4)." Section 601.03, M.P.E.P., 7th Ed

SEND CORRESPONDENCE TO

Ladas & Parry
26 West 61st Street
New York, N.Y. 10023

DIRECT TELEPHONE CALLS TO:
(Name and telephone number)

William R. Evans
(212) 708-1930

(complete the following if applicable)

Since this filing is a [ ] continuation [ ] divisional there is attached hereto a Change of Correspondence Address so that there will be no question as to where the PTO should direct all correspondence.

DECLARATION

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Docket No. 4760.3

SIGNATURE(S)

NOTE: Carefully indicate the family (or last) name, as it should appear on the filing receipt and all other document.

NOTE: Each inventor must be identified by full name, including the family name, and at least one given name without abbreviation together with any other given name or initial, and by his/her residence, post office address and country of citizenship. 37 C.F.R. Section 1.63(a)(3).

NOTE: Inventors may execute separate declarations/oaths provided each declaration/oath sets forth all the inventors. Section 1.63(a)(3) requires that a declaration/oath, inter alia, identify each inventor and prohibits the execution of separate declarations/oaths which each sets forth only the name of the executing inventor. 62 Fed. Reg. 53,131, 53,142, October 10, 1997,

Full name of sole or first inventor

Patrick J. RAINSFORD
(Given Name) *(Middle Initial or Name)* *Family (Or Last Name)*

Inventor's signature (x) Patrick Rainsford

Date (x) OCT 2 2 2001 **Country of Citizenship** IRISH

Residence 80 Park Avenue, Sandymount, Dublin 4, IRELAND

Post Office Address SAME AS ABOVE

Full name of second joint inventor, if any

(Given Name) *(Middle Initial or Name)* *Family (Or Last Name)*

Inventor's signature _____

Date _____ **Country of Citizenship** _____

Residence _____

Post Office Address _____

Full name of third joint inventor, if any

(Given Name) *(Middle Initial or Name)* *Family (Or Last Name)*

Inventor's signature _____

Date _____ **Country of Citizenship** _____

Residence _____

Post Office Address _____

(check proper box(es) for any of the following added page(s) that form a part of this declaration)

[ ] **Signature** for fourth and subsequent joint inventors. *Number of pages added* _____

* * *

[ ] **Signature** by administrator(trix), executor(trix) or legal representative for deceased or incapacitated inventor. *Number of pages added* _____

* * *

[ ] **Signature** for inventor who refuses to sign or cannot be reached by person authorized under 37 C.F.R. Section 1.47. *Number of pages added* _____

* * *

[ ] Added page for **signature** by one joint inventor on behalf of deceased inventor(s) where legal representative cannot be appointed in time. (37 C.F.R. Section 1.47)

* * *

[ ] Added pages to combined declaration and power of attorney for divisional, continuation, or continuation-in-part (C-I-P) application.

[ ] Number of pages added _____

* * *

[ ] Authorization of practitioner(s) to accept and follow instructions from representative.

(If no further pages form a part of this Declaration, then end this Declaration with this page and check the following item)

[x] This declaration ends with this page.